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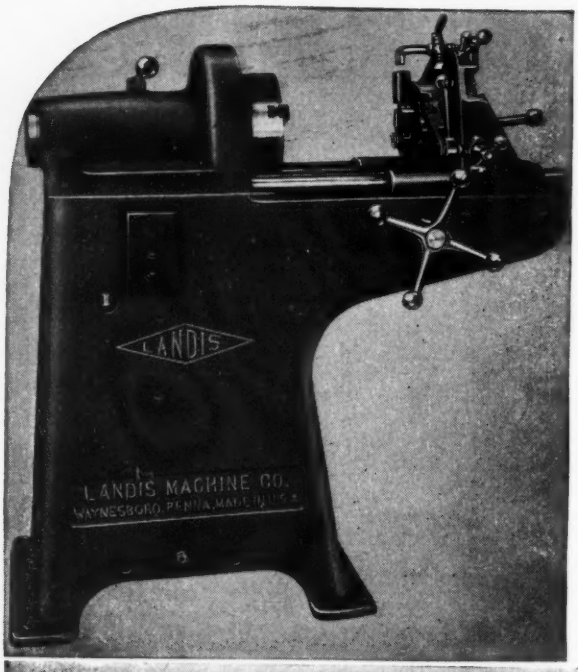

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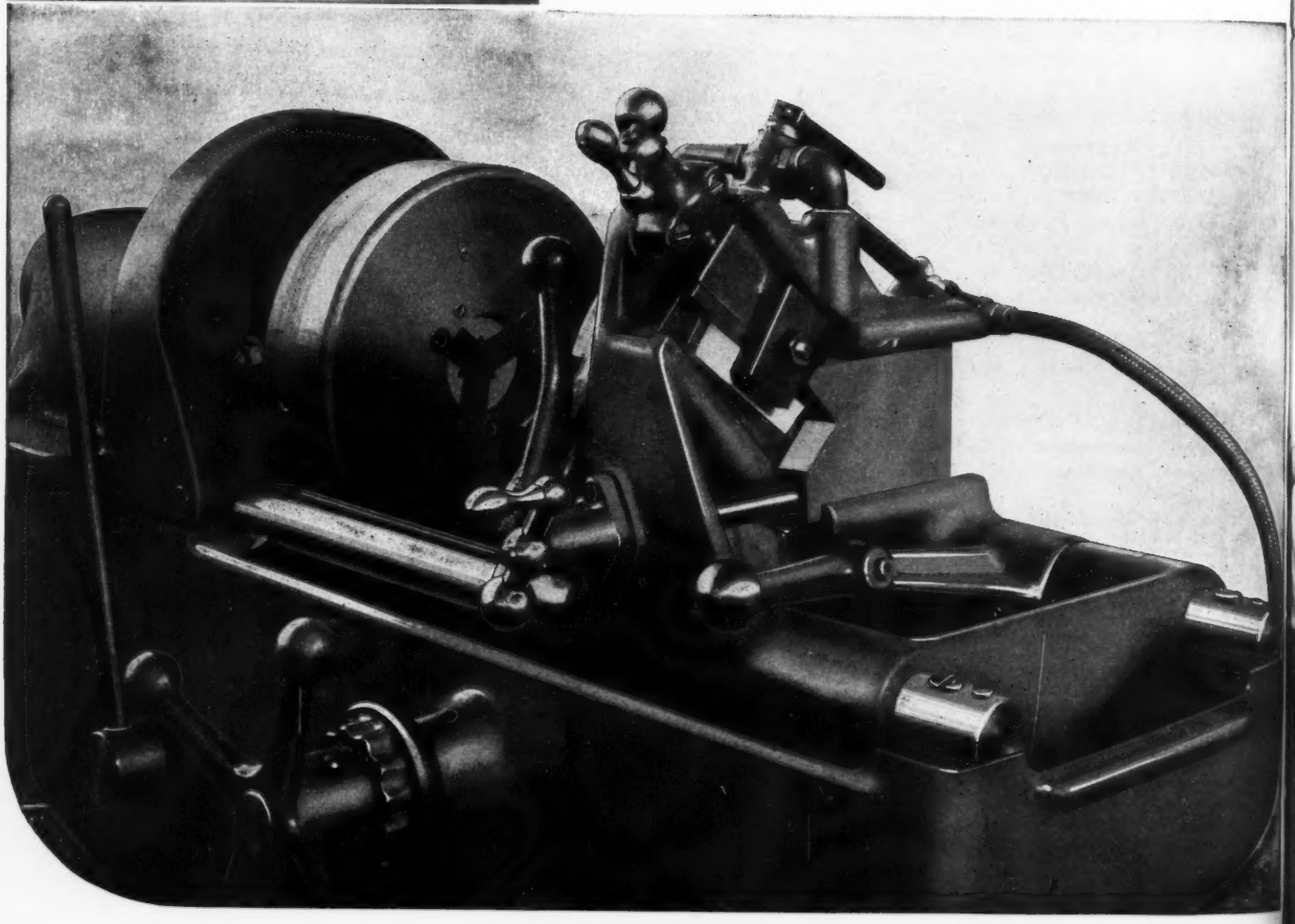

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Transfer Type Presses Speed Output of Electric Ranges

Unusual Mass-Production Techniques Employed at the New Hotpoint Plant Enable 600,000 Electric Ranges to be Turned out per Year

By B. E. SCHROEDER
Vice-President, Manufacturing
Hotpoint, Inc., Chicago, Ill.

RATED at a capacity of 12,000 ranges per week, the new factory of Hotpoint, Inc., in Chicago is the world's largest electric range plant. This production practically equals the capacity of the entire pre-war industry. An outstanding example of the mass-production techniques employed in this plant is the use of transfer type presses for performing as many as ten operations on a single part.

Among the parts produced with this equipment are the drawers for electric ranges. Previously, these drawers were bent to shape and welded, requiring a blanking press, eight press brakes, and two welders. With the present method, the drawers are turned out completely on a single transfer type press, including forming and deep-drawing operations.

The advantages of the new method are that only two operators are required, material-handling is practically eliminated, machine main-

tenance is reduced to a minimum, and production is increased.

The range drawers are produced on the Verson Transmat press, Fig. 1, one of the largest completely automatic drawing presses ever built. Six operations are performed simultaneously in this press, and a completed drawer, measuring 15 by 18 by 6 inches, is produced at every stroke. The press operates at 8 1/2 strokes per minute producing 510 drawers per hour.

A single main slide carries the slides for each die station. The press ram has a stroke of 22 inches, and each slide is individually adjustable through 3 inches. This eccentric type drive press, which measures 262 inches between housings and is installed in a pit 30 feet deep, is rated at 450 tons capacity.

Coils of cold-rolled deep-drawing steel, 20 gage (0.036 inch thick) by 31 inches wide, are fed into the first die station of the press by a Littell roll feed and straightening unit. At this station, Fig. 2, the coil stock is blanked and drawn to the finished depth of 6 inches. Just prior to the blanking and drawing operation, the coil stock is automatically coated on the top surface with lubricating oil from spray guns. A combination hydraulic-pneumatic cushion is provided in the bed of the press at this drawing station. From this point on, the inverted drawers are carried from station to station by an electrically operated transfer feed mechanism. This mechanism consists of two horizontal aluminum members provided with fingers that hold the work while it is advanced to the next station. The transfer bars are mounted on the bed of the press, one in front of and the other behind the dies.

The two transfer bars operate together, with a rectangular motion in a horizontal plane. Their motion is first inward, toward the center line of the press, where the fingers grasp the parts. Next, the bars move sideways, advancing each part one station and locating them for the next operation. The fingers then release the parts, and the bars move outward away from the center of the press, returning to their original positions for the next cycle. Movements of the transfer feed bars and fingers are synchronized with the motion of the ram slide by means of selsyn motors, amplidyne generators, and rotary-cam limit switches.

Partial and finish trimming of the flange on the drawer is performed at the second and third stations, Fig. 3. By dividing the trimming operation so that two opposite flanges of the drawer are trimmed at each station, the scrap can be cut into small pieces which drop through openings in the die onto a conveyor underneath the press. At the fourth, fifth, and sixth stations, the flanges are progressively formed to a 9/16-inch curl.

Trim rings, which are placed around the heating units on the electric ranges, are formed from stainless-steel circular blanks on the Verson ten-station press seen in Fig. 4. This transfer type

Fig. 1. Transfer type press which performs six operations, including deep-drawing, on range drawers, 510 completed drawers being turned out per hour

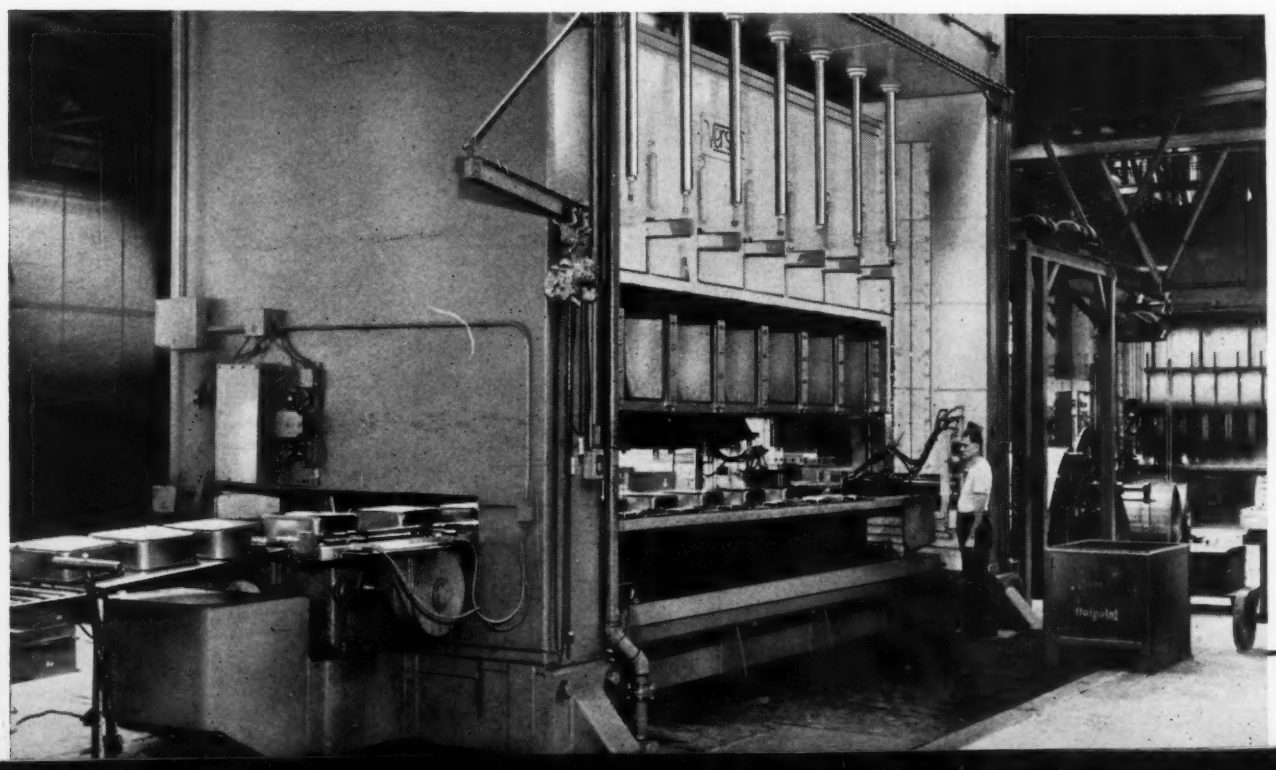


Fig. 2. First station of the transfer type press illustrated in Fig. 1. Here the coil stock is blanked and drawn to the shape seen at the left of the photograph

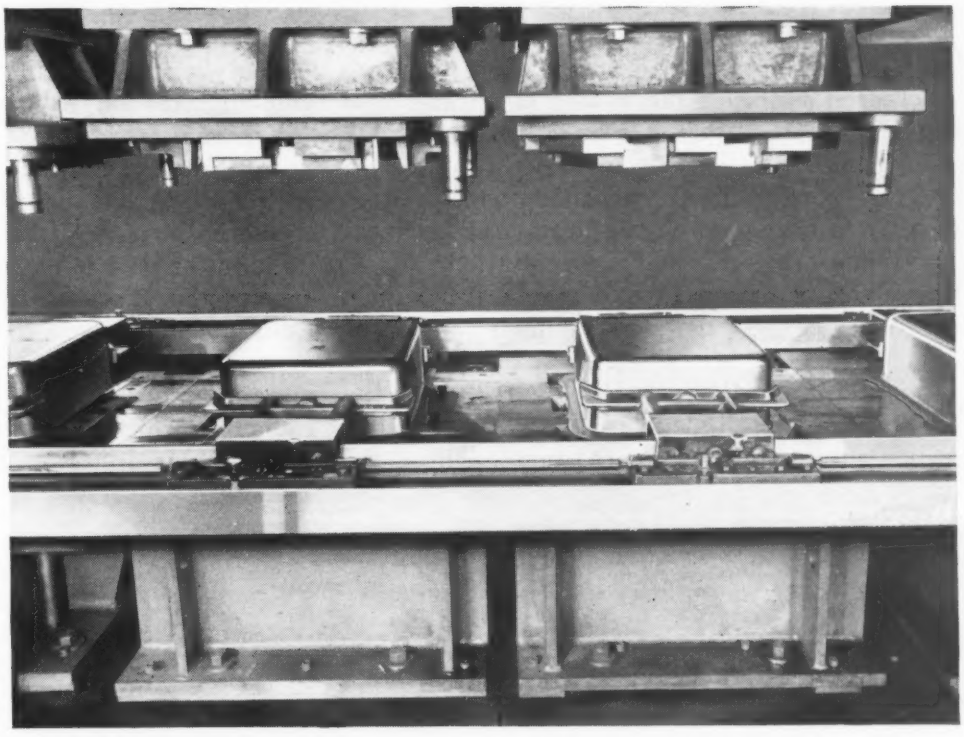


Fig. 3. At the second and third stations, the flange on the drawer is trimmed. The drawers are carried from station to station on the press by an electrically operated transfer feed mechanism

Fig. 4. The trim rings for the heating units on electric ranges are formed at the rate of 780 per hour on the ten-station transfer type press illustrated

press, which is rated at 250 tons, completely forms 780 trim rings per hour. Previously, these rings were produced in a series of operations on seven different presses.

The circular steel blanks, 8 1/16 inches in diameter by 0.035 inch thick, are placed in a three-position automatic stack feeder at the right-hand end of the press, as shown in Fig. 5. The reason for employing preblanked material instead of coil stock for this operation is that more blanks can be obtained per ton of steel by using a staggered arrangement on wider coil stock in a separate press. A suction cup lifts each blank to the proper level for it to be transferred by the feed-fingers. The blanks are separated by a blast of air to prevent feeding more than one at a time. When one stack has been unloaded, the feeder is indexed to bring another stack below the suction cup. The total capacity of the stack feeder is approximately 800 blanks.

The transfer feed mechanism employed is similar to that used on the press that produces the range drawers. At the first station, Fig. 6, the blank is drawn to a depth of 0.480 inch. The lever seen at the right contacts the top of the blank as it is transferred to the drawing station. If more than one blank is fed under the lever at the same time, a switch will be tripped, which automatically stops the press. The spray gun seen at the right of the punch automatically applies drawing compound to the top surface of each blank prior to the operation.

At the second station, an inverted blanking die is employed to blank out the center portion of the drawn ring. An automatic "shovel" unloader, part of which can be seen at the upper left in Fig. 6, catches the blanked portion when the upper die knock-out operates at the top of the ram stroke. When the ram descends, the shovel swings backward, away from the die, ejecting the blanks into a tote box. These blanked disks are used in producing smaller sized trim rings.

A wiping operation is performed on the inner periphery of the part at the third station, while at the fourth and fifth stations, the periphery of the flange is trimmed and the part is deburred. The sixth station is idle, due to the size of the cam-operated die required at the seventh station.

The cam-operated die, Fig. 7, is employed to pierce six slots, each only 1/16 inch wide by 1/4 inch high, in the vertical wall of the trim ring. A die cushion located in the bed of the press permits the part to be pushed below the top surface of the die when the punch descends. The cams mounted around the periphery of the punch enter recesses in the top face of the die, causing piercing punches in the body of the die to move radially toward the center, and pierce the slots in the required location in the part.

Fig. 5. Stainless-steel circular blanks are automatically fed, one at a time, to the transfer press by means of the three-position stack feeder here illustrated

Fig. 6. At the first station of the transfer press, the blank is automatically coated with drawing compound and then drawn to a depth of 0.480 inch

After passing through another idle station, the part is subjected to a coining operation to insure accuracy of form and size. At the tenth, and final, station, another cam die pierces and forms two 45-degree retaining prongs or ears in the vertical wall of the trim ring. Completed trim rings are ejected from the left-hand end of the transfer press onto a conveyor.

Sheets of enameling steel, 0.044 inch thick, 127 9/16 inches long, and 40 inches wide, are transformed into electric range bodies at the rate of 200 per hour on the completely automatic press and welding line seen in Fig. 8. A battery of four 380-ton Bliss presses, two special bending machines, a Progressive multiple-spot seam-welder, and two National automatic resistance welders are employed in this production line.

The blanked sheets are stacked on a loading platform in front of a Dexter feeder, seen in the left foreground, by means of an overhead crane. The feeder automatically separates the sheets and lifts one at a time to a roller table in front of a Kane & Roach edge trimmer. Approximately 9/16 inch of stock is removed from each side of the sheet as it automatically passes through the trimmer.

Trimmed sheets, 38 7/8 inches wide, are deposited on a table immediately in front of the first Bliss press. A chain type transfer mechanism, equipped with dogs that contact the edges of the material, moves the sheet intermittently through the series of presses. In the first press, the sheet is embossed and pierced. Although the presses are capable of making 18 strokes per minute, an interrupted stroking cycle is necessary to permit transferring the sheets from press to press.

In the second press, several holes are pierced, a drawer opening is punched out, flanges are notched, and the ends of the sheet are trimmed to size. Since the numerous holes in each range body are spaced too close together to permit

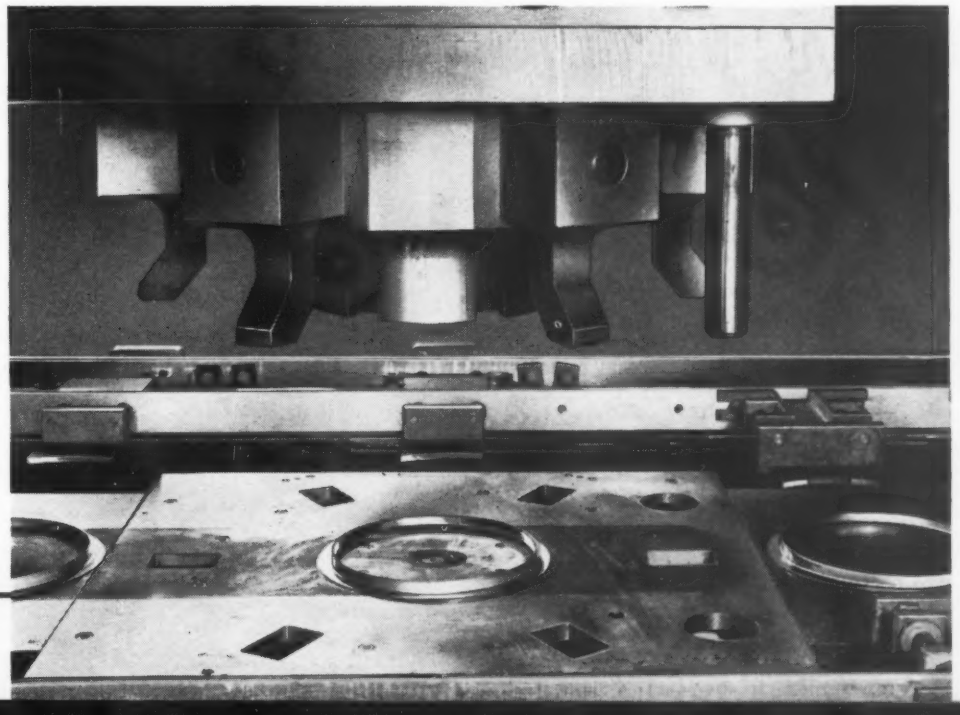


Fig. 7. Stations 6 and 8, seen to the right and left, respectively, are idle to allow sufficient space for the cam-operated die required at the seventh station for piercing six radial slots in the vertical wall of the work

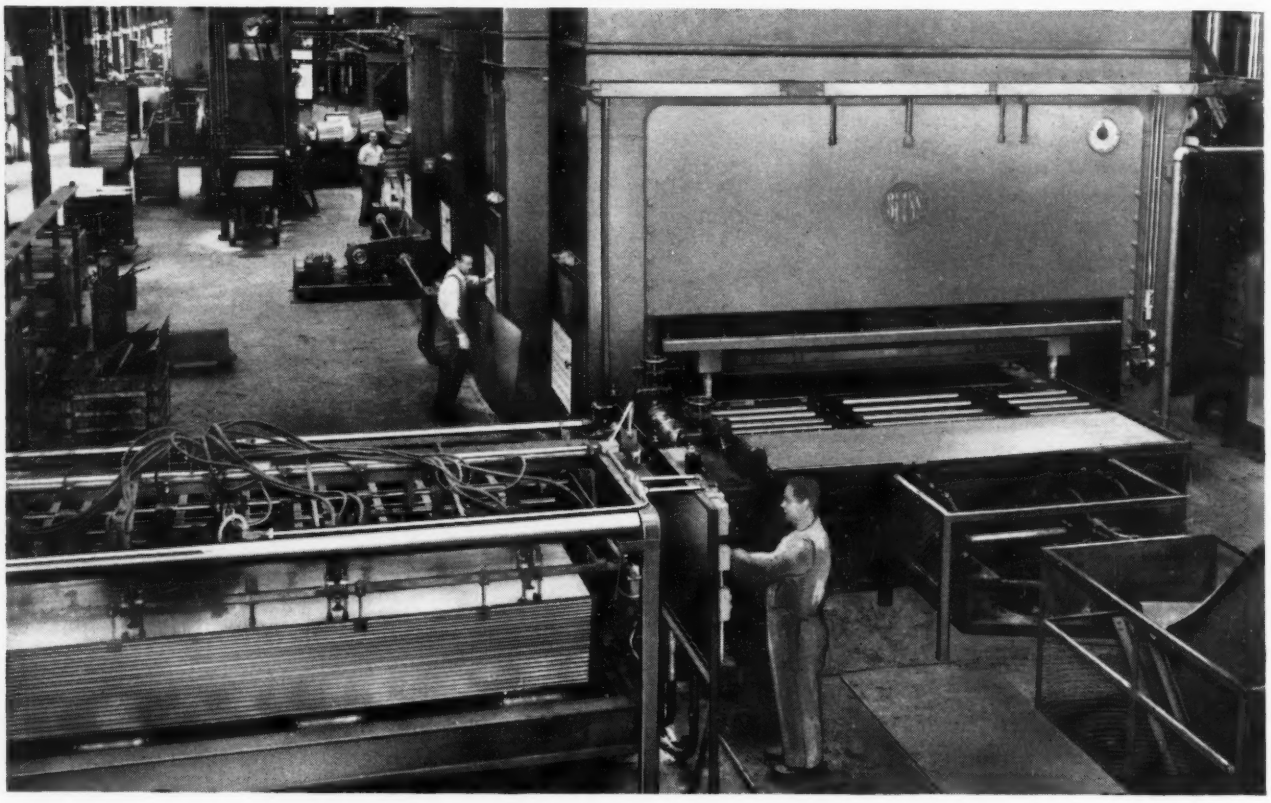


Fig. 8. A completely automatic press and welding line is employed to produce electric range bodies from steel sheets at the rate of 200 per hour

piercing all of them at the same time, the piercing operations are divided between the presses. Notching of the flanges is completed, two more drawer openings are punched out, and the remaining holes are pierced in the third press. Lugs are lanced and formed in all flanges of the sheet during the final press operation.

Two special forming machines progressively bend the flat sheet into an open-ended box section. The overlapping seam formed in these operations is joined by ten spot-welds in the Progressive automatic seam-welder seen in Fig. 9. The range body is then automatically transferred to one of two National resistance welders for completion of the welding. This is followed by various finishing operations.

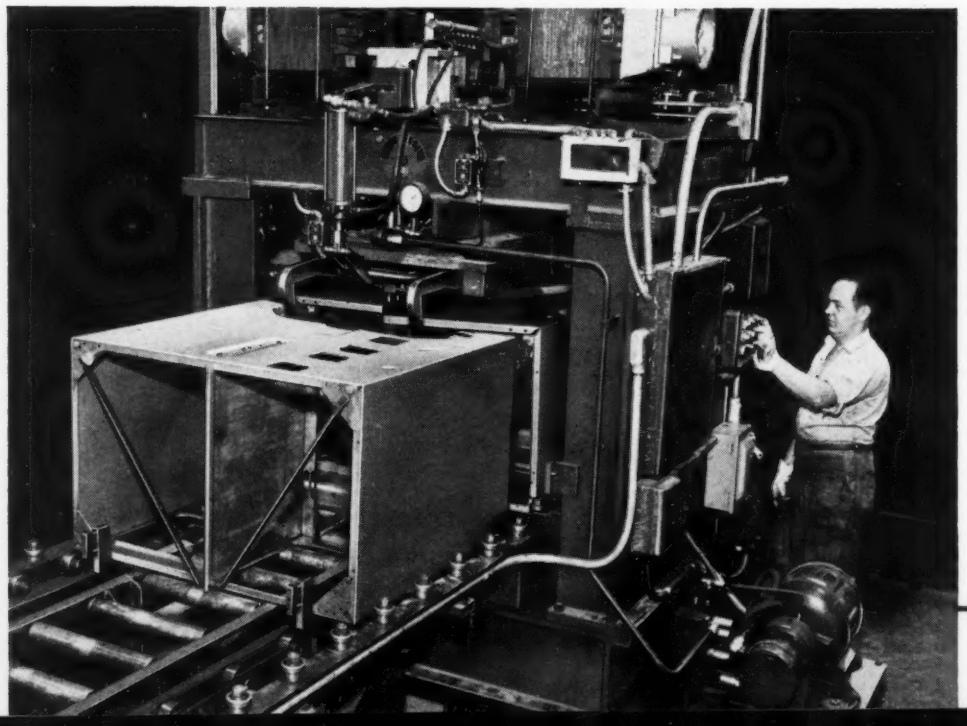


Fig. 9. Overlapping seam of formed range body is joined by ten spot-welds in an automatic resistance welding machine

The Shaper as a Manufacturing Tool

The Versatility and Metal-Removing Capacity of Shapers are Not Always Fully Utilized. Some Examples of Effective Applications of This Type of Machine in Modern Manufacturing are Described Here

By J. J. MURPHY, Sales Engineer
The Cincinnati Shaper Co.
Cincinnati, Ohio

Fig. 1. Two slots are cut simultanously in circular feed racks at the rate of twenty-five per hour with the set-up shown

THROUGHOUT the metal-working industry—from the intermittent manufacture of made-to-order parts in small repair or maintenance shops to the continuous mass-production of interchangeable work-pieces in large industrial plants—the shaper is becoming more and more prominent as a manufacturing tool. Hogging out of metal and precision finishing of parts to close tolerances are both within the scope of this versatile type machine. Quick set-ups, high-production rates, and low tooling costs account for the increasing application of these machines in modern industry. Some examples of effective applications are described in the following.

One method often employed to increase production on the shaper is to make several cuts simultaneously. This can be accomplished by the use of multiple tools or a form tool. In one case, two slots, 3/8 and 3/4 inch wide, are cut at one time by means of the high-speed steel form tool seen in Fig. 1. The cast-steel circular feed racks are machined at the rate of twenty-five per hour with the set-up shown. A simple work-holding fixture facilitates loading and unloading the work.

Malleable-iron castings, such as the one shown at the left in Fig. 2, are machined to produce the Warnock diagonal block, seen at the right, in an unusual automatic operation at the Printing Machine Co.'s plant in Cincinnati. Such blocks are used on flat-bed presses to hold the printing plates and provide means for registering.

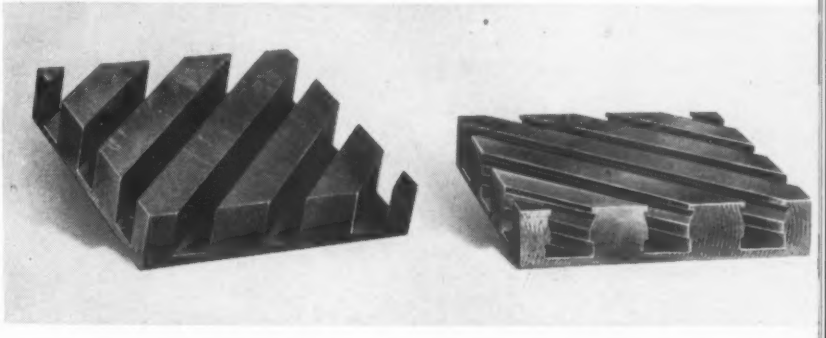


Fig. 2. Malleable-iron castings (left) are machined at the rate of 100 per hour in producing diagonal blocks such as seen in the right-hand view

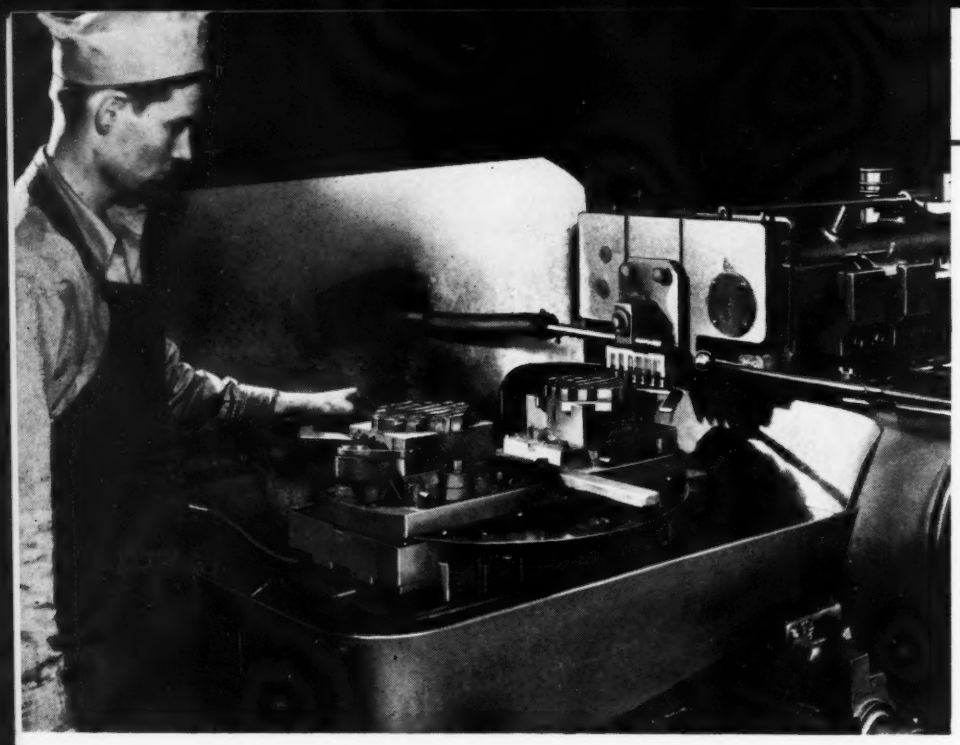


Fig. 3. A tool-holder carrying six form-ground high-speed steel tools is used to produce blocks such as seen in Fig. 2

Fig. 4. (Below) Set-up and machining time are reduced to a minimum in shaping glass molds by using four tools mounted in a special holder

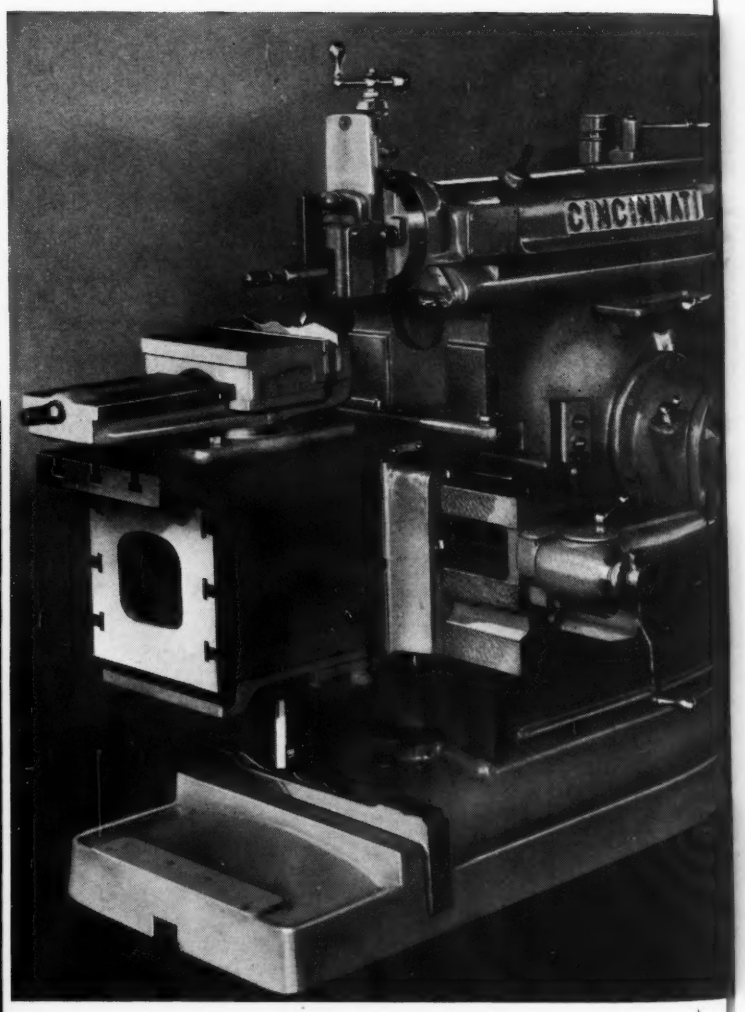
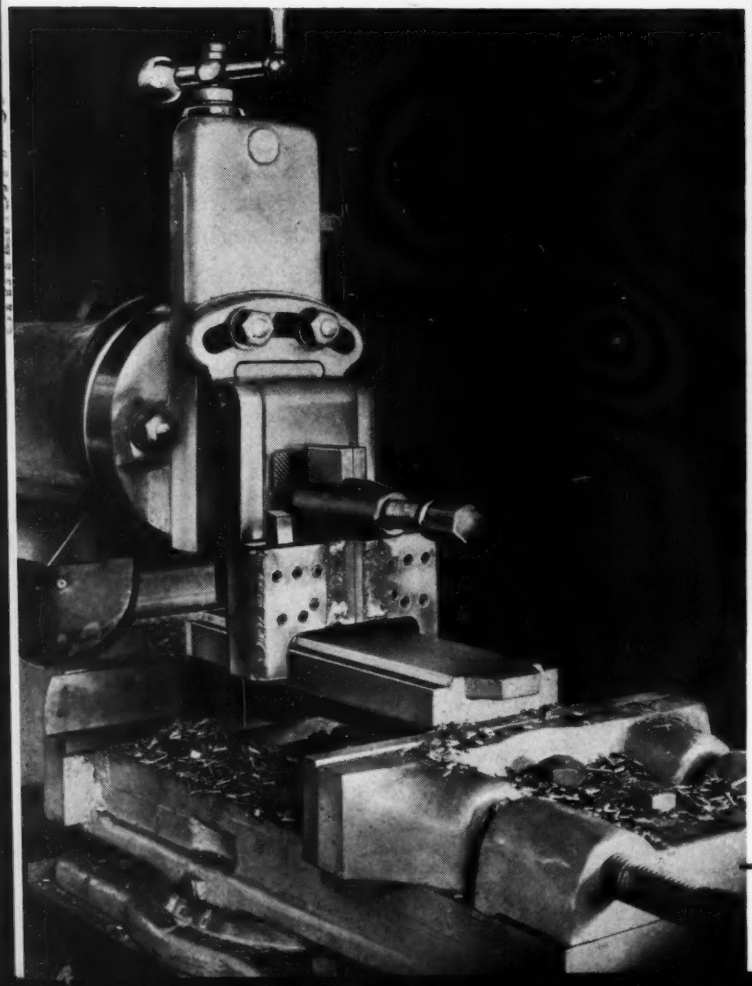


Fig. 5. (Right) Various-shaped blocks and clamps are produced with this automatic duplicating set-up. Vertical table movement is controlled by a follower and templet



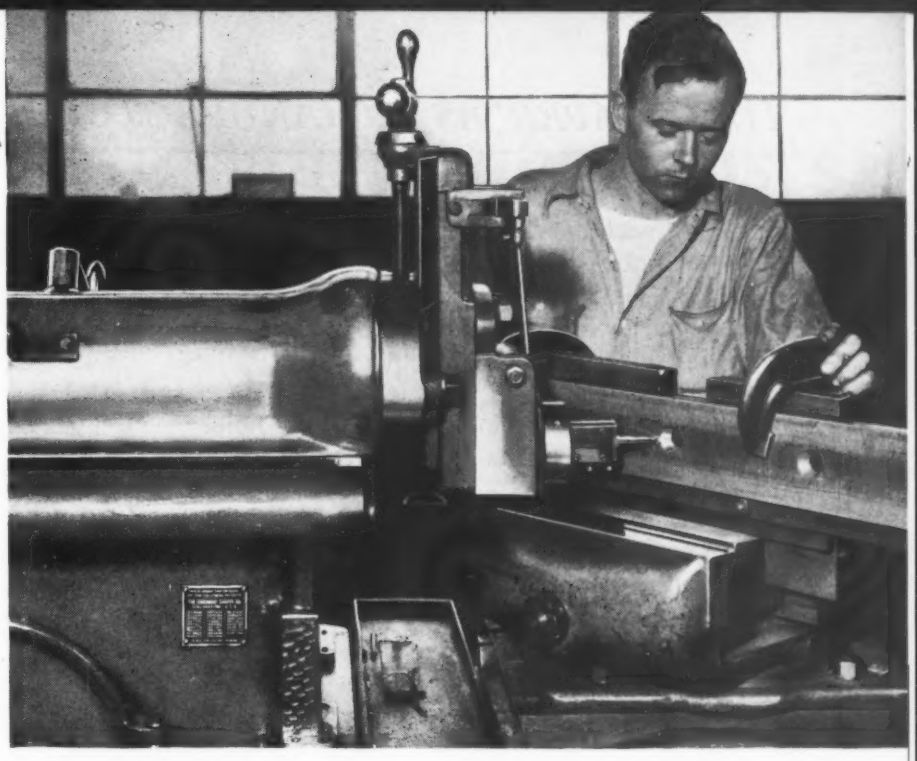


Fig. 6. Fourteen holes are notched in a shear knife in five minutes by means of the shaper set-up illustrated

A special 24-inch Cincinnati shaper, Fig. 3, not equipped with table feed or power rapid traverse, is used to machine the slots in the blocks. Feed is obtained from movement of the head, and the cycle is completely automatic. After the operator starts the machine by means of the clutch lever, the tool-head automatically feeds to the right for nine strokes, returns to the center of the slots, and then feeds to the left for nine strokes. In addition, automatic tool relief is provided between each cutting stroke. A cam then trips the spring-loaded clutch lever to stop the machine with the ram in its back position.

A completed block is unloaded and a casting is loaded into one fixture while a part is being machined in the second fixture. At the completion of the shaping operation, the operator indexes the table through an angle of 180 degrees, and the cycle is repeated. Blocks are produced at the rate of 100 per hour, the yearly production amounting to as much as 60,000.

The specially designed gang tool-holder used in this operation carries six form-ground, high-speed steel tools. The shaper is operated at 44 strokes per minute, with a 14-inch stroke and a cutting speed of 89 surface feet per minute. Cimcool is employed as the coolant, and approximately 1000 parts are machined before the tools have to be reground.

An application of the shaper on precision work is the finishing of four edges on half of a glass mold simultaneously with the set-up seen in Fig. 4. Accuracy is held within $\pm$ 0.0005 inch,

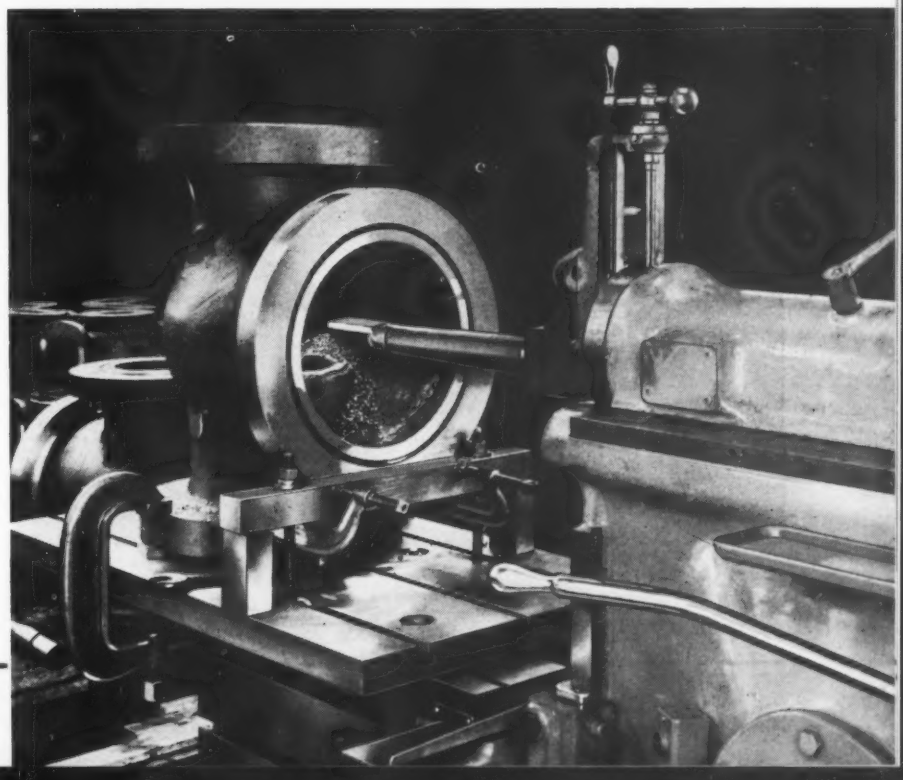


Fig. 7. Internal machining to close tolerances is accomplished on a 10-inch gate-valve body, weighing approximately 400 pounds, with the shaper set-up shown

since the part must be interchangeable and fit the other half of the mold. The molds are made from a special alloy chilled cast iron.

A special tool-holder is employed to clamp the four high-speed steel tools rigidly in the desired positions. The tool-holder is quickly positioned by means of locating pins on back of the holder. Each set of mold parts is completed in twenty minutes.

An example of automatic duplicating on a shaper is seen in Fig. 5. In the production of various forms, the vertical table movement is controlled by a follower and templet. The follower roll is pinned to a shaft projecting from the under side of the shaper table, while the templet is bolted to the base of the shaper. The automatic shaping set-up shown is employed in making quenching clamps and chisel blocks used in the manufacture of Nicholson files.

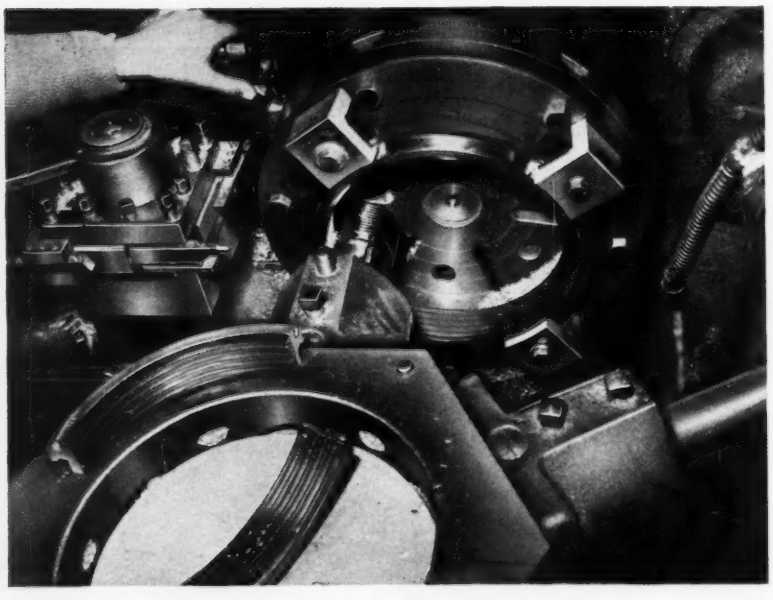
Many sizes and shapes of blocks and clamps, including flat, square, round, half-round, and triangular, are produced in large quantities with this set-up. Production rates range from five to fifteen minutes each. High-speed steel tools are employed, with a feed of 0.030 inch per stroke. The depth of cut varies with the part being produced.

Bolt-holes in high-carbon, high-chromium shear knives are notched in the shaper set-up seen in Fig. 6. The notches, or slots, hold projections on the bolts, preventing the bolts from rotating when nuts are tightened on them. The shear knives, used for cutting sheet metal and steel plates, are produced at the Ohio Knife Co., Cincinnati, Ohio.

Fourteen holes are notched in each knife, the total time required being approximately five minutes. A high-speed steel tool bit is employed, and the shaper is operated at 119 strokes per minute with a 2-inch stroke. Production requirements necessitate the full-time use of one shaper on two shifts. Other shapers in the same plant are used to miter the ends of knives and to machine contours in the cutting edges, as well as for such operations as slotting, corrugating, and beveling.

One of the ten shapers used by the William Powell Co., Cincinnati, Ohio, for the internal shaping of guides on gate valves is seen in Fig. 7. A 10-inch, flanged-end gate-valve body weighing about 400 pounds is mounted on the table of the 32-inch shaper. A high-speed steel double-edge tool is employed, with a 20-inch stroke. The tool is fed 0.010 inch per stroke, and the shaper is operated at 8 strokes per minute.

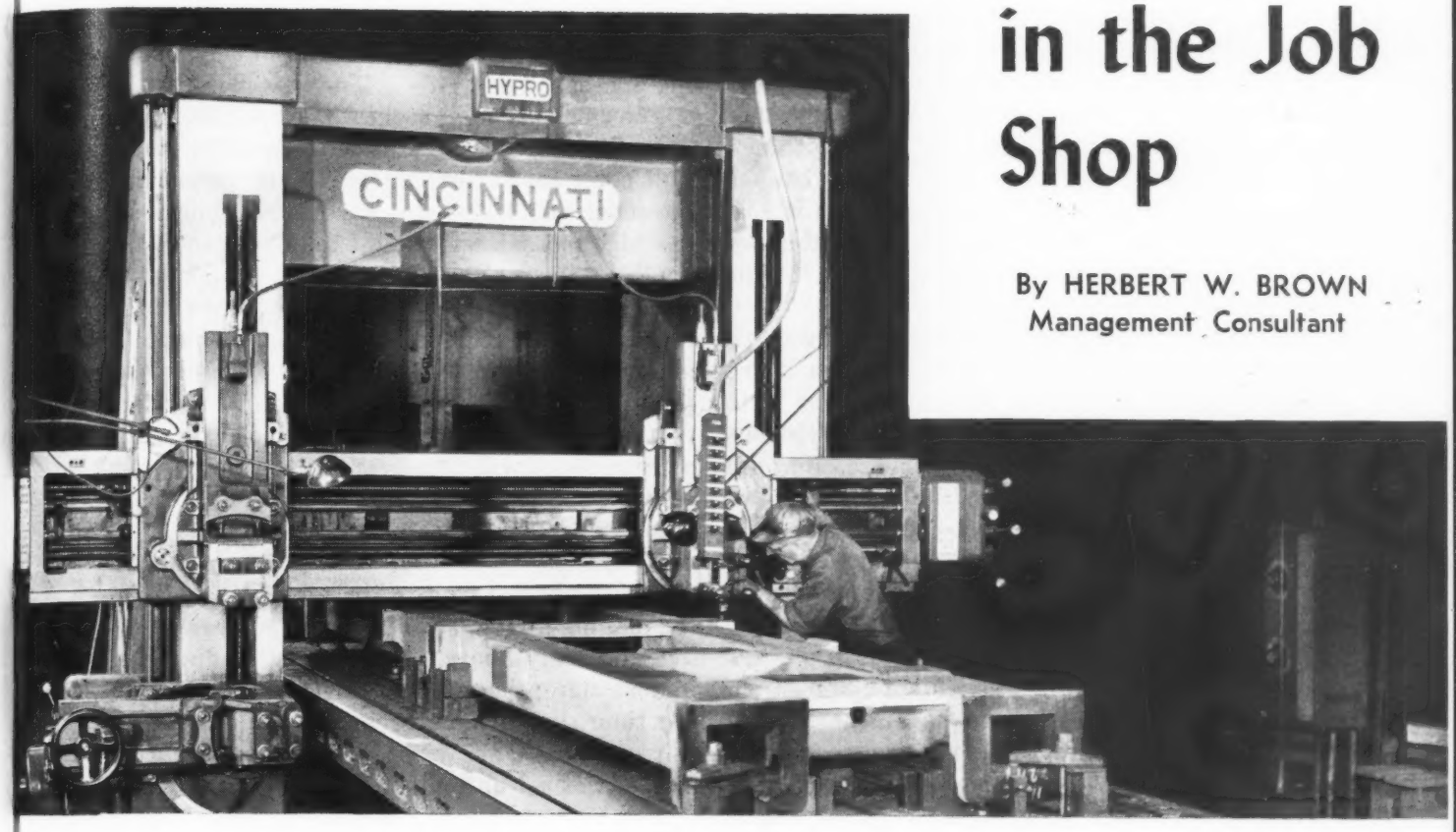
Yearly production on this job is approximately 50,000 valves, ranging in size from 8 inches, weighing 150 pounds, to 30 inches, weighing 2500 pounds. The welded- and flanged-end valve bodies are made from low- or medium-carbon cast steel. Disk guides are machined to within ± 0.001 inch of the desired size.



Bronze labyrinth seals required in the manufacture of steam turbines are grooved in the Sunnyvale, Calif., plant of the Westinghouse Electric Corporation by the use of a circular form tool on a turret lathe. Four labyrinth seal sections are mounted at one time in the faceplate fixture. Since the bronze parts are highly abrasive, the use of circular form cutters, which can be easily reground as they become dull, has resulted in substantial savings

How to Estimate Machining Costs in the Job Shop

By HERBERT W. BROWN
Management Consultant



This Article, which Outlines a Practical Method of Estimating the Cost of Planer Jobs, is the First in a Series that will Cover All the Basic Types of Machine Tools

SUCCESSFUL operation of small and medium-sized machine shops that are run on a job-lot basis generally depends upon a satisfactory method of determining the cost of machining individual work-pieces. If the price quoted for a job is too high, the customer will give another shop the work, and if the price is too low, money will be lost on the job.

In many shops, there are widely varying opinions concerning the time required to do a job. This is because the estimators have had different backgrounds of experience. A customary practice is to estimate manufacturing costs on the basis of complete machines or assemblies. In some cases, estimates are based on past costs, and these may result in too high quotations because of machining errors, inadequate job planning, charges to wrong account numbers, etc., on the previous job. Cost figures that are not based on detailed estimates made on component parts of an assembly will lead to unsatisfactory results. Moreover, unless there is some accurate method of predicting machining time and unless such time estimates are based on actual machine performance expectancy, the ultimate results will be too general.

When demands on industry are great, competition may become a secondary factor and certain inefficiencies in making cost estimates can be tolerated. However, the results of loosely made estimates should not be permitted to become integrated in the shop routine because they result in inflated estimates, which may mean lost business when normal conditions return to the industry. The cost estimating methods to be described in this article, and in the following articles in this series, have been used successfully for five years in a medium-sized shop.

While the plan is especially suitable for small and medium-sized shops, it is also applicable in

individual departments of large metal-working plants and especially in tool-rooms. The present article will deal specifically with the estimating of machining costs on work performed by planers. Subsequent articles will deal with such other basic machine tools as shapers, drilling machines, milling machines, grinding machines, and so on. The system to be outlined will provide for reasonable variations due to differences in efficiency and in the age and operating condition of the equipment used.

In establishing any basis for estimating costs, the almost universal question that arises is the proper operating speeds. If management is to expect the best results, it must correct obvious inefficiencies—mechanical or otherwise. Because a planer, or, in fact, any machine tool, may have been set up at a low operating speed for a certain job, there is no reason why it should continue to be operated at 50 or 60 per cent of normal speed for other work.

It is not uncommon to find belt-driven planers being operated at slow speeds of 20 to 30 feet per minute because the shop management has no personal knowledge of the operating condition of the machines. All too often, shop management accepts an operator's viewpoint that a particular machine tool is too light to be operated at normal speeds. There are even cases where modern machines, which have been designed for normal speeds with heavier cuts, are run at slow operating speeds.

The efficiency of a machine is a relative matter, depending on its age and condition; the important point is to utilize the maximum potential of the machine. If, because of outmoded design, a machine tool is incapable of taking cuts equal in depth to those that can be taken by a heavier, higher powered machine, an additional cut may be required to remove the necessary amount of material. No gain would be made by an increase in speed, since this would be offset by the extra cut. A study made of uncontrolled shop methods and practices will usually show that low speeds, as well as an excessive number of cuts, are responsible for high production costs.

Before the installation of a program such as the one to be outlined in these articles, the time for planing a lathe apron ranged between thirty-five and forty hours. Preliminary studies made in developing the program showed that the planing time should have been between twelve and thirteen hours per piece. After improving the methods of set-up and cutter grinding, the time was reduced to slightly less than the calculated time. Had no predetermined time base been

Table 1. Time in Minutes Required for

Roughing Speed	Length of Stroke, in Feet						
	½	1	2	3	4	5	6
Over-run and Reversing	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386
Stroke Time	0.0124	0.0248	0.0496	0.0744	0.0992	0.1240	0.1488
Total Time per Stroke	0.0510	0.0634	0.0882	0.1130	0.1378	0.1626	0.1874
Finishing Speed	**Length of Stroke, in Feet**						
	½	1	2	3	4	5	6
Over-run and Reversing	0.0457	0.0457	0.0457	0.0457	0.0457	0.0457	0.0457
Stroke Time	0.0172	0.0343	0.0686	0.1029	0.1372	0.1715	0.2058
Total Time per Stroke	0.0629	0.0800	0.1143	0.1486	0.1829	0.2172	0.2515

Note: The times here given are based on planer builders' recommended speeds (roughing, element and for machine servicing, such as tool grinding, work measuring, etc. The allowances

established for comparison, the poor operating condition would not have been disclosed.

Because of the many variations in job-shop machining, there is only a theoretical standard of time measurement for machining a given piece. This condition is also true on high production; however, the time variable will be relatively smaller in the latter case. Time-study analyses will show machining time variations from piece to piece, and although fundamentals do not change, the range of time fluctuation becomes greater as the quantity becomes smaller.

With this in mind, the data to be presented will prove of value in establishing a means of providing predetermined time standards on which estimates may be made. This data includes a planned sequence of machine operations which will serve as a basis of cost comparisons and should result in continued correction and improvement of plant operation.

Instructions for Calculating Planer Speeds

The first step necessary in determining planer speeds is to time-check the speed in feet per minute of the planer table. To accomplish this with reasonable accuracy, several traverse strokes should be time-measured for a given stroke length, not including reversing time. It will be found that if the stroke is measured for a given distance between points of contact of the reversing levers, a true travel time can be determined.

This procedure should be repeated for the return stroke. The accumulated distance in feet traveled both during traverse and return throughout the test period should be computed independently, in order to determine the total table travel per minute. The reversing time must also be time-checked in a manner so that it can be separated from the traverse and return stroke time, because this time element is fixed for each stroke that the planer is operated.

The high and low speeds used in the following example were found to be considerably below normal for planer operation and were later corrected; however, as this condition may exist in other shops, these speeds are used as an example.

To determine the table travel in feet per minute, divide the total distance of bed travel by the travel time as given in Table 1, for high-speed traverse and return and for low-speed traverse and return:

For high-speed traverse,

$$\frac{\text{3000 feet total table travel}}{\text{80 minutes of travel time}} = 37.5 \text{ feet per minute}$$

Different Lengths of Planer Strokes

Length of Stroke, in Feet								
7	8	9	10	11	12	13	14	15
0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386
0.1736	0.1984	0.2232	0.2480	0.2728	0.2976	0.3224	0.3472	0.3720
0.2122	0.2370	0.2618	0.2866	0.3114	0.3362	0.3610	0.3858	0.4106

Length of Stroke, in Feet								
7	8	9	10	11	12	13	14	15
0.0457	0.0457	0.0457	0.0457	0.0457	0.0457	0.0457	0.0457	0.0457
0.2401	0.2743	0.3086	0.3429	0.3772	0.4115	0.4458	0.4801	0.5144
0.2858	0.3200	0.3543	0.3886	0.4229	0.4572	0.4915	0.5258	0.5601

55 feet per minute; finishing, 40 feet per minute). Allowance should be made for the human given in the foot-note accompanying Table 2 are satisfactory for general purposes.

Table 2. Typical Planer Time Chart Based on a Feed of 0.010 Inch per Stroke. (Time Given in Minutes)

Width of Work, Inches	Type of Cut	Length of Stroke, Feet															
		½	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
½	Rough	3	4	6	7	9	10	12	14	15	17	18	20	21	23	24	26
	Finish	4	5	7	9	11	14	16	18	20	22	24	26	29	31	33	35
1	Rough	6	8	11	14	17	20	23	27	30	33	36	39	42	45	48	51
	Finish	8	10	14	19	23	27	31	36	40	44	49	53	57	61	66	70
2	Rough	13	16	22	28	34	40	47	53	60	65	72	78	84	90	96	103
	Finish	16	20	29	39	46	54	63	71	80	89	97	106	114	123	131	140
3	Rough	19	24	33	42	52	61	70	80	90	99	108	117	126	135	145	154
	Finish	24	30	43	56	69	82	94	107	120	133	146	159	172	184	197	210
4	Rough	26	32	44	56	69	81	94	106	120	131	144	156	168	180	193	205
	Finish	32	40	57	74	92	109	126	143	160	177	194	216	229	246	263	280
5	Rough	32	40	55	70	86	101	117	133	150	164	180	195	210	226	241	257
	Finish	40	50	72	93	115	136	157	179	200	222	233	265	286	307	329	350
10	Rough	64	79	110	140	172	203	234	265	300	327	359	389	420	451	482	513
	Finish	79	100	143	186	229	272	314	357	400	443	486	529	572	614	657	700
20	Rough	128	158	220	280	344	406	468	530	600	654	718	778	840	902	964	1026
	Finish	158	200	286	392	458	544	628	714	800	886	972	1058	1144	1228	1314	1400
30	Rough	192	237	330	420	516	609	702	795	900	981	1077	1167	1260	1353	1446	1539
	Finish	237	300	429	558	687	816	942	1071	1200	1329	1458	1587	1716	1842	1971	2100

Note: Allowances have been added to these figures for delays, 10 per cent; tool grinding, 5 per cent; personal, 5 per cent; and measuring, 5 per cent, making a total of 25 per cent.

For high-speed return,

$$\frac{\text{3000 feet total table travel}}{\text{30 minutes of travel time}} = \text{100 feet per minute}$$

For low-speed traverse,

$$\frac{\text{1500 feet total table travel}}{\text{57.3 minutes of travel time}} = \text{26.2 feet per minute}$$

For low-speed return,

$$\frac{\text{1500 feet total table travel}}{\text{21.5 minutes of travel time}} = \text{70 feet per minute}$$

To determine the time in minutes required for each foot of stroke, divide 1 minute by the speed in feet per minute, as shown in the following:

For high-speed traverse,

$$\frac{\text{1 minute}}{\text{37.5 feet per minute}} = \text{0.0267 minute per foot of stroke}$$

For high-speed return,

$$\frac{\text{1 minute}}{\text{100 feet per minute}} = \text{0.01 minute per foot of stroke}$$

Then

Time per foot of stroke, traverse	0.0267
Time per foot of stroke, return	0.0100
Total time per foot of stroke, high speed	0.0367

For low-speed traverse,

$$\frac{\text{1 minute}}{\text{26.2 feet per minute}} = \text{0.0382 minute per foot of stroke}$$

For low-speed return,

$$\frac{\text{1 minute}}{\text{70 feet per minute}} = \text{0.0143 minute per foot of stroke}$$

Then

Time per foot of stroke, traverse	0.0382
Time per foot of stroke, return	0.0143
Total time per foot of stroke, low speed	0.0525

It should be emphasized that the speeds given in this example are not intended to be used in setting up standards, but rather to show what conditions may be encountered when the plan is being installed. Speeds recommended by the machine builders should be adopted wherever practical. The following speeds are recommended today by planer builders as a general guide:

Material	Speed, Feet per Minute
Cast iron	
Roughing	45 to 55
Finishing	30 to 40
Cast steel	
Roughing	30 to 40
Finishing	30 to 40
Forgings, mild steel	
Roughing	45 to 55
Finishing	30 to 40
Bronze or brass (not manganese)	
Roughing	150 to 200
Finishing	100 to 150
Aluminum	
Roughing	200 to 300
Finishing	150 to 200

The planer time charts, Tables 1 and 2, were based on machine builders' recommended speeds. In these charts, a roughing speed of 55 feet per minute and a finishing speed of 40 feet per minute were used, which result in a reduction of time per foot of stroke, as compared with the previous example, from 0.0367 to 0.0248 minute for roughing and from 0.0525 to 0.0343 minute for finishing. Any shop adopting this cost estimating plan may determine by tests the most practical speeds for its particular equipment.

Before a basic time chart can be established, it is necessary to take into consideration the tool over-run and reversing time. In most instances, a planer table should attain full operating speed during 4 inches of travel after reversal. However, loose belts will cause slippage, and in such instances loss of speed will occur. When this condition exists, correction should be made.

It will be found generally that 0.02 minute is ample time to allow for reversing. Then, taking into account the 4 inches of over-run plus 0.02 minute for reversing, we have a fixed time per stroke of 0.0386 minute for roughing and 0.0457 minute for finishing. This is a fixed charge for any given length of stroke.

The next step in establishing a time chart for planer work is to compute the time per given length of stroke, as shown by the Stroke Time Chart, Table 1.

The question of proper feeds and speeds for most jobs is highly controversial. Opinions differ from shop to shop, regardless of the condition of the equipment. Fundamentally, the factors affecting the choice of feeds and speeds are the condition of the machine set-up, kind and hardness of materials to be machined, and the manner in which the cutters are ground. The last factor is of particular importance, as cutters not properly ground will become heated excessively because of friction. Many mechanics have not learned the art of grinding tool bits or other types of cutters properly. As a result, speeds, as well as feeds, are often reduced in order to suit an improperly ground cutter.

Before any attempt is made to adopt proper standards of performance, the management may have to review the shop technique in grinding cutters so that standards can be established that will meet requirements; otherwise, improvement programs will fall short of anticipated results.

The Planer Conversion Chart, Table 3, was designed to bring to the estimator's attention certain job conditions that must be considered in estimating times. It provides a simple short-cut in arriving at the time per cut based upon certain work materials and set-up conditions. In most instances, the feeds shown by the chart can be exceeded. However, it is not the purpose of these articles to determine the most efficient job

Table 3. Planer Conversion Chart

Based on Roughing Speed of 55 Feet per Minute and Finishing Speed of 40 Feet per Minute

Material	Set-up Condition	Speed	Conversion Factors	Feed per Stroke, Inch
Cast Iron				
Hard	All Set-ups	Low	0.1000–0.167	0.100–0.060
Medium Soft	Rigid Set-up	High	0.0555–0.0833	0.180–0.120
Medium Soft	Strong Set-up	High	0.0833–0.167	0.120–0.060
Medium Soft	Weak Set-up	High	0.1000–0.167	0.100–0.060
Soft	Rigid Set-up	High	0.0500–0.0833	0.200–0.120
Soft	Strong Set-up	High	0.0625–0.0833	0.160–0.120
Soft	Weak Set-up	High	0.1000–0.167	0.100–0.060
Finishing	All Set-ups	Low	0.0833–0.02	0.120–0.500
Steel				
Hot-Rolled, Machinery	Rigid Set-up	High	0.0555–0.0833	0.180–0.120
Hot-Rolled, Machinery	Strong Set-up	High	0.0670–0.10	0.150–0.100
Cold-Rolled, Low-Carbon	Rigid Set-up	High	0.0670–0.0833	0.150–0.120
Cold-Rolled, Low-Carbon	Strong Set-up	High	0.0714–0.10	0.120–0.100
Castings, Carbon	Strong Set-up	Low	0.0670–0.10	0.150–0.100
Castings, Carbon	Weak Set-up	Low	0.0833–0.142	0.120–0.070
Castings, Alloy Free Machining	Strong Set-up	Low	0.0670–0.0833	0.150–0.120
Castings, Alloy Free Machining	Weak Set-up	Low	0.0833–0.142	0.120–0.070
Castings, Alloy Tough Machining	All Set-ups	Low	0.1000–0.167	0.100–0.060
Finishing	All Set-ups	Low	0.0833–0.02	0.120–0.500
Brass and Medium Bronze	Rigid Set-up	High	0.0500–0.0833	0.200–0.120
Brass and Medium Bronze	Good Set-up	High	0.0555–0.10	0.180–0.100
Brass and Medium Bronze	Weak Set-up	High	0.0833–0.125	0.120–0.080
Bronze-Manganese	Rigid Set-up	High	0.0670–0.10	0.150–0.100
Bronze-Manganese	Good Set-up	High	0.0714–0.125	0.140–0.080
Bronze-Manganese	Weak Set-up	High	0.0833–0.167	0.120–0.060

practice, but rather to present a method and procedure by which the average shop can adopt its own program.

In setting up the time chart Table 2, a basic feed of 0.010 inch per stroke was used. When this principle is applied in setting up other charts, it is preferable to use the lowest feed the machine provides; this will give the longest possible time to machine a given surface. In order to convert the basic time to selected time for machining a surface, the selected feed is divided by the charted feed to obtain a conversion factor by which the chart figure is multiplied to arrive at the proper time for machining a given surface.

Example—Determine the required time for rough-machining a surface 15 inches wide by 12 feet long. One cut is required, the material is soft gray iron, and the job set-up is strong. The work surface is plain, without interrupted cuts. A selected feed of 0.160 inch per stroke is to be used. As the time chart Table 2 does not include figures for a work surface 15 inches wide, figures must be selected for a surface 10 inches wide and for another surface 5 inches wide and the two figures added together. Thus:

Charted time for 5″ by 12′ surface = 210 min.
Charted time for 10″ by 12′ surface = 420 min.

Charted time for 15″ by 12′ surface = 630 min.

Dividing the charted feed by the selected feed:

$$\frac{\text{0.010 inch chart feed}}{\text{0.160 inch selected feed}} = 0.0625 \text{ conversion factor}$$

The total charted time (630 minutes) times the conversion factor (0.0625) = 39.375, or about 39 minutes per cut. Any selected feeds to suit shop conditions may, of course, be used in determining the conversion factor.

In developing a time chart such as shown in Table 2, any basic feed can be employed and the

(Concluded on page 166)

Example of a tool estimating sheet made out by the estimator for a specific job. The work, in this case, is the planing of a soft gray iron casting 36 inches wide by 48 inches long by 12 inches thick with a rigid set-up. Only one piece is machined at a time

Form 333 Revised

ESTIMATOR

TOOL ROOM TIME ESTIMATE SHEET ____ OF ____

TOOL NAME	DATE ESTIMATED	TOOL NO.
Bolster	4/30/49	T-10295-1

TOOL ALTERATION	QUAN.	ITEM NAME	ITEM NO.
	1	Bolster	1

SYM. NO.	TOOL ORDER NO.
	8091

INSP'R NO.	TYPE AND SIZE CUTTER	SPEED FT/MIN R. P. M.	FEED IN/MIN IN/REV	SEQ. NO.	OPERATION	MACH. TYPE	NO. CUTS	SET UP TIME HRS.	MACH. TIME HRS.	TOTAL EST. TIME	TOTAL ACTUAL TIME
	Solid	55	120	1	Rough Plane Top Surface	12'	1	1½	.9	2.4	
		55	120	1	Rough Plane Bottom Surface		1	½	.9	1.4	
		55	120	1	Rough Plane Edge		1	.7	.3	1.0	
		40	500	1	Finish Plane Edge		1	.3	.2	.5	
		40	500	1	Finish Plane Top Surface		1	.5	.3	.8	
		55	120	1	Rough Plane Bottom for Fin Cut		1	.5	.9	1.4	
		40	120	1	Finish Plane Bottom Surface		2	.5	.5	1.0	

TOTAL ESTIMATED HOURS	4.5	4.0	8.5
PLUS INCENTIVE ALLOWANCE			
TOTAL HOURS			

Political Phonies

HENRY FORD II, in a recent address before a group of economists, stressed the need for individual productivity and declared that the notion that many can have plenty by taking it from a few is a "political phony as old as history."

Indisputably, high individual productivity has made us the greatest industrial nation in the world and given us a standard of living that is way beyond that of any other country. To maintain and raise this level of prosperity, it is necessary that we constantly increase our rate of man-hour productivity. The only way for us to get more things for our use and comfort, year after year, is to produce more. More dollars in the pay envelope without more goods to buy means only higher prices. Unfortunately, there seem to be important men in political and labor circles who apparently do not believe in this fundamental economic principle, and consequently our rate of productivity has gone downward instead of upward.

Productivity can obviously be increased by wider application of modern labor-saving machinery, but another way would be to reduce substantially the production losses due to needless strikes and labor disturbances. The opportunity in this direction is manifestly great for government, labor, and industry.

In a truly democratic country, there will never be any set of legal regulations that will entirely eliminate disagreements between labor and management, but great progress could be made in that direction if our political leaders would pass laws designed to protect the national welfare and public interest instead of the selfish interests of special groups.

Labor leaders are exerting tremendous pressure in an effort to cancel out important provisions of the Taft-Hartley Act and force legislative action strongly in favor of the labor unions, regardless of the national welfare. Greater productivity and lower prices should be their objective.

And this brings us to another political phony—the odium of "slave labor law" given to the Taft-Hartley Act by Messrs. Green and Murray. Recently the National Small Business Men's Association printed advertisements in newspapers the country over, asking those gentlemen to explain this definition. Mr. Green provided the following answer:

"The Constitution of the United States provides that involuntary servitude shall not be imposed on any individual except as punishment for crime. Yet the Taft-Hartley Law authorizes the use of injunctions, which, when applied, compel workers to work against their will. That is slavery and involuntary servitude, practiced in a free America."

What tommyrot! In this free country, a man who does not want to work for a company while his union officials are negotiating with the management for settlement of a controversy (even under the compulsion of an injunction) can quit his job and get work elsewhere—that is, if the unions will let him do so. No man is a slave who gets paid for his work and is free to change his job at will. No more so than when a man is forced by his union to go on a strike that he feels is unjustified.

Senator Taft and other Congressional leaders who are opposed to a complete return to the Wagner Act have expressed their willingness to change any regulations of the present labor-management act that may be detrimental to the working man himself and to develop a new act that would lead to harmonious relations between labor and management because it would be fair to both. That should also be the attitude of labor and of the Democratic Administration.

The time has come to discard all political phonies and to develop labor-management legislation that will be equally fair to labor, management, and the general public—legislation that will reduce labor difficulties, not increase them.

Charles O. Herb

How to Estimate Machining Costs in the Job Shop

(*Continued from page 164*)

conversion factors adjusted in accordance. The finest feed possible should always be used in laying out these charts, so that they will be applicable to any job set up on the planer.

The degree of success attained through the adoption of this estimating program will depend largely upon coordination between the shop and the estimator. Well laid out methods of machining procedure must be developed by the estimator in cooperation with the shop management.

It is highly recommended that as an initial step the shop equipment be conditioned to bring about the best productive results. Considerably greater gains will be achieved if this is carried out. However, reconditioning the equipment will not, in itself, provide the necessary coordination, which must be obtained by uniform operating procedure and standardization of estimating practices.

The importance of proper tool grinding should not be neglected. An old machine tool will be made more productive by using properly ground cutters of all types. If the shop is sufficiently large to warrant a cutter grinding department, such a department should be considered.

It is vitally important that such details as speeds, feeds, and method of planning the machining operations be recorded and forwarded to the shop supervisors and to the machine operators. This can be done through the use of a form such as shown on page 164. This is necessary to insure that the pre-planned work will be carried out as originally prescribed. If this is not done, the probability of conflicting machining procedures will greatly reduce, and perhaps nullify, the value of the job estimates.

It is likewise highly desirable that the elapsed time for the completed work be recorded, in comparison with the original estimate, so that discrepancies can be analyzed with a view to correcting failures caused by inadequate or incomplete planning methods. The success of an estimating program depends to a considerable extent upon the proper follow-through.

The suggested form provides a record of all the necessary data required by the shop for practically all types of machine tools. It will be noted that provision is made for designating the speed either in feet per minute or in revolutions per minute, according to the type of machine used. Also, the feed may be stated either in inches per minute or in inches per revolution. The form may be printed in duplicate and forwarded to as many department heads as desirable—engineering, accounting, timekeeping, etc. This practice will provide pertinent information to all concerned, and will bring to the attention of the management instances where losses occur, which should result in continued improvement in shop methods and practices. The record also provides a means by which management can more adequately appraise the efficiency of its supervision.

The estimator should, for obvious reasons, be fairly well versed in shop practices, as well as having a talent for the appraisal of values, and he must not be biased in his views. Initiative and alertness are essential in carrying out an estimating program successfully. If these qualifications are present in the estimator, the cost estimating program will effect big economies—a 25 per cent improvement in efficiency is readily obtainable even in well operated shops.

No attempt has been made to establish estimating procedures for machine set-up time since this factor is far too variable, and must be determined by the estimator's familiarity with his particular shop and in accordance with the prevalent facilities and supervision. It is recommended that this problem be thoroughly discussed by all concerned and a policy be determined that will be applicable to the machine tool as well as to the general type of set-up involved.

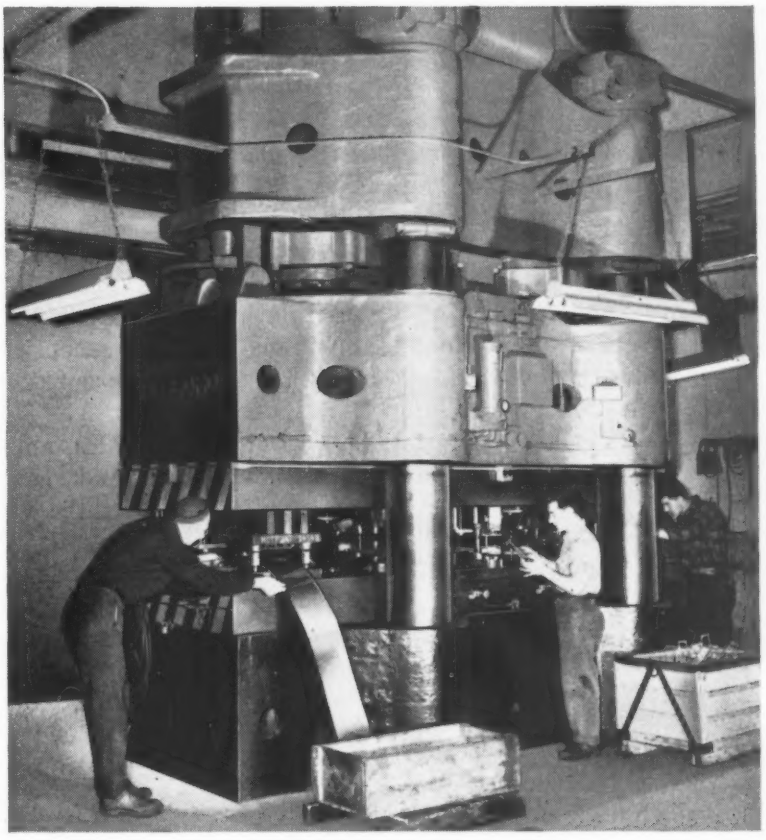
Conclusion

The estimating procedure here outlined is not meant to supplant job analyses, but rather to place before the estimator information that will facilitate the estimating and resultant lowering of machining costs. The purpose is to present the data in a manner that will permit installation of the system in the average job or low-quantity production shop. It has been successfully introduced in plants producing an output of several hundred thousand dollars annually. There will be time differentials between the machining of several pieces, compared to one or two pieces. The person desiring to set up an estimating program will obviously have to determine such differentials. No attempt has been made to establish maximum feeds and speeds, since standards vary from shop to shop.

This article has discussed the planing of plain, continuous surfaces only. The next article, which will deal with shapers, will consider the procedure to be followed in estimating costs for machining surfaces at opposite ends of long parts, such as lugs. The procedure is applicable also to planing operations.

Seven Dies Operated Simultaneously on a Large Hydraulic Press

By GEORGE H. DeGROAT



AMONG the many metal products designed and manufactured by Etched Products Corporation, Long Island City, N. Y., are refrigerator and appliance parts, escutcheons and bezels, name plates, decorative parts, and radio and television panels. Many of these parts require blanking, piercing, trimming, and the formation of lettered inscriptions, symbols, and decorative designs which are produced by embossing.

Refrigerator compartment fronts, meter cases, and automobile instrument panels are representative of parts requiring complicated embossing. One of the more interesting of the embossed parts made in this plant is the escutcheon shown in Fig. 1. This is for the "Hotpoint" automatic electric range, and is typical of the complex identification plates made for various appliances.

The stamping operations performed in the production of this part include blanking, embossing, trimming, and piercing. Five dies are used, two being required for embossing. One embossing die forms the entire pattern and all of the letters, while the second is employed to raise the smaller letters in sharp relief. The blanking die is so designed that by nesting the stock, two blanks are made at each stroke of the press.

All five dies are placed together in the 2000-ton hydraulic press shown in the heading illustration. This press, built by the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., has sufficient die space to accommodate several other dies besides the five used for the escutcheon. In the set-up described, the blanking die is removed after half an order is complete, inasmuch as two blanks are produced for each complete escutcheon made with the other dies. The space thus made available, together with the die area not used for this job, is utilized for dies that perform stamping operations on other work. Hence, several jobs can be done simultaneously.

Three operators are required for the escutcheon stamping operation. The five dies are arranged in the press as shown diagrammatically in Fig. 2. Here the blanking die is indicated at *A*, the first embossing die at *B*, the trimming die at *C*, the piercing die at *D*, and the second embossing die at *E*. (Dies for other jobs are shown at *F* and *G*.)

One operator loads and unloads the blanking die as shown in Fig. 3. A second operator, at the station illustrated in Fig. 4, loads and unloads the first embossing die and loads the trimming die. He also actuates the main operating lever of the press. The third operator, shown in Fig. 5, unloads the trimming die and loads and unloads the piercing die and the second embossing die.

A safety feature was developed for this press by the Etched Products Corporation particularly to suit the three-man operation. At every station there are two control buttons, each operating an air valve. The valves are in a line connected to

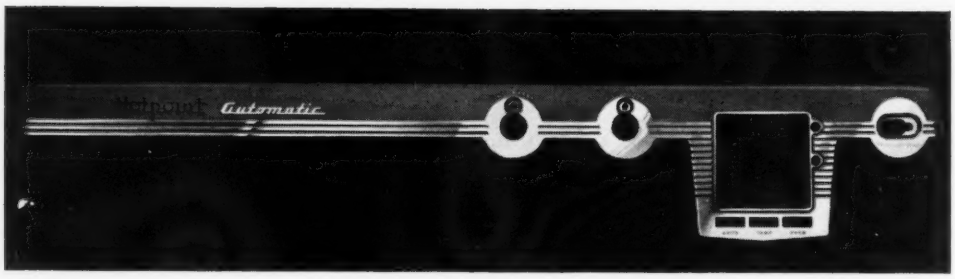


Fig. 1. Embossed escutcheon for "Hotpoint" automatic electric range, made at a high rate of production by the use of multiple dies on a large hydraulic press

an air cylinder at the main switch. The air-cylinder piston engages and locks the main operating lever, releasing it only when all three operators have opened their control valves.

A further check is provided by a system of lights on the press, which offers a visual means of warning the operator at the main lever when the other operators are loading or unloading the dies. There are red and green lights at each station. A red light is on when the dies are open, and a green light when the air-cylinder control buttons have been depressed to close the dies.

The maximum working pressure for any given job can be set by means of a control consisting of a reverse-flow type of relief valve with a micrometer adjustment, which is connected to the pressure gage. This automatically limits the maximum tonnage that can be applied by the moving platen. In case of excessive pressure, an alarm, interconnected with this control, sounds to insure immediate attention.

Of the 2000-ton capacity of the press, 1500 tons are applied to the stamping operations required for the job described. The escutcheon is made of 0.030-inch soft brass, in strips of 9 1/4 inches wide by 96 inches long. One complete part is produced at each stroke of the press, and the production rate averages 72 pieces per hour, often running as high as 85 per hour.

Several features in the design of this press contribute largely to the efficiency of the operation. The hydraulic system, for example, is of the variable-displacement type, which gives a high degree of accuracy in the control of the platen movements. Operating controls on the variable-delivery, rotary-piston pump govern the entire working cycle of the press. With these accurate controls, slow platen movement is obtained for trying out new work or for setting up dies, and pressure may be built up very slowly and sensitively. Rapid approach of the platen to the work is provided by surge valves which permit a large volume of oil to flow to the main cylinders until the resistance of the work is met. This resistance increases the oil pressure in the main cylinders, closing the valves, after which working pressure is applied from the pump without shock.

The pump prevents accidental dropping of the moving platen as long as the motor is driving it; as a safety precaution, an automatic pull-back shut-off device is provided to hold the platen whenever the motor is stopped. The moving platen has a working stroke of 2 1/2 feet and a maximum stroke of 3 feet. Three feet of daylight space is available when the press is open, and the die space exceeds 40 square feet. In general, the accurate control of movement and the steady pressures obtained combine to insure

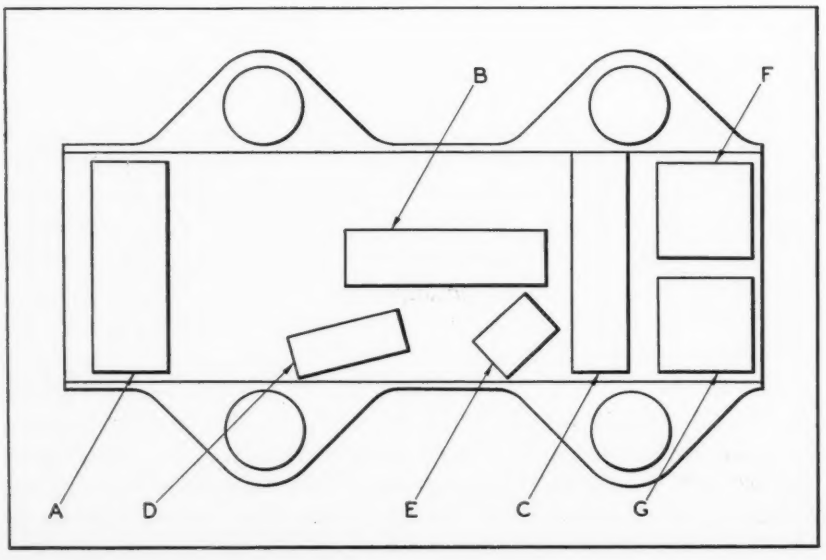


Fig. 2. Diagram of die layout in 2000-ton hydraulic press for stamping the escutcheon shown in Fig. 1. The blanking die is indicated at (A), the first embossing die at (B), the trimming die at (C), the piercing die at (D), and the second embossing die at (E)

Fig. 3. At the blanking station the operator feeds soft brass strip to the die, which produces two escutcheon blanks at each press stroke. He then unloads the die, as shown, and passes the blank to the operator at the first embossing die

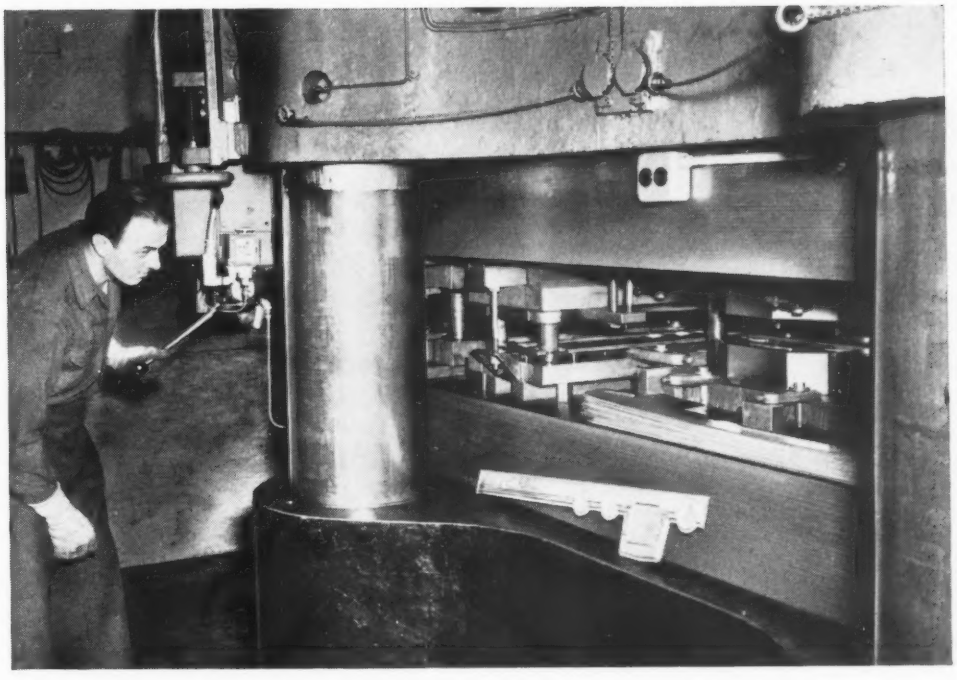


Fig. 4. The first embossing die produces the pattern and all the letters on the escutcheon. This die is loaded and unloaded by an operator who also loads the trimming die and operates the main control lever

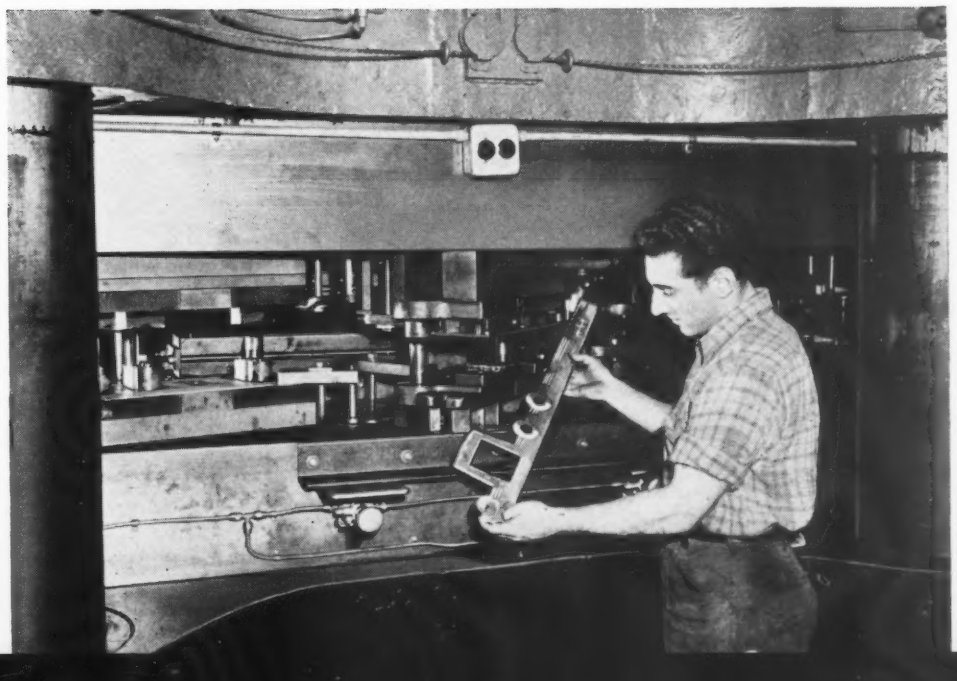


Fig. 5. The trimming die is unloaded and the piercing die and the second embossing die are loaded and unloaded by the third operator

Fig. 7. The overspray is removed from escutcheons by rubbing with felt blocks after they have been subjected to an initial drying cycle

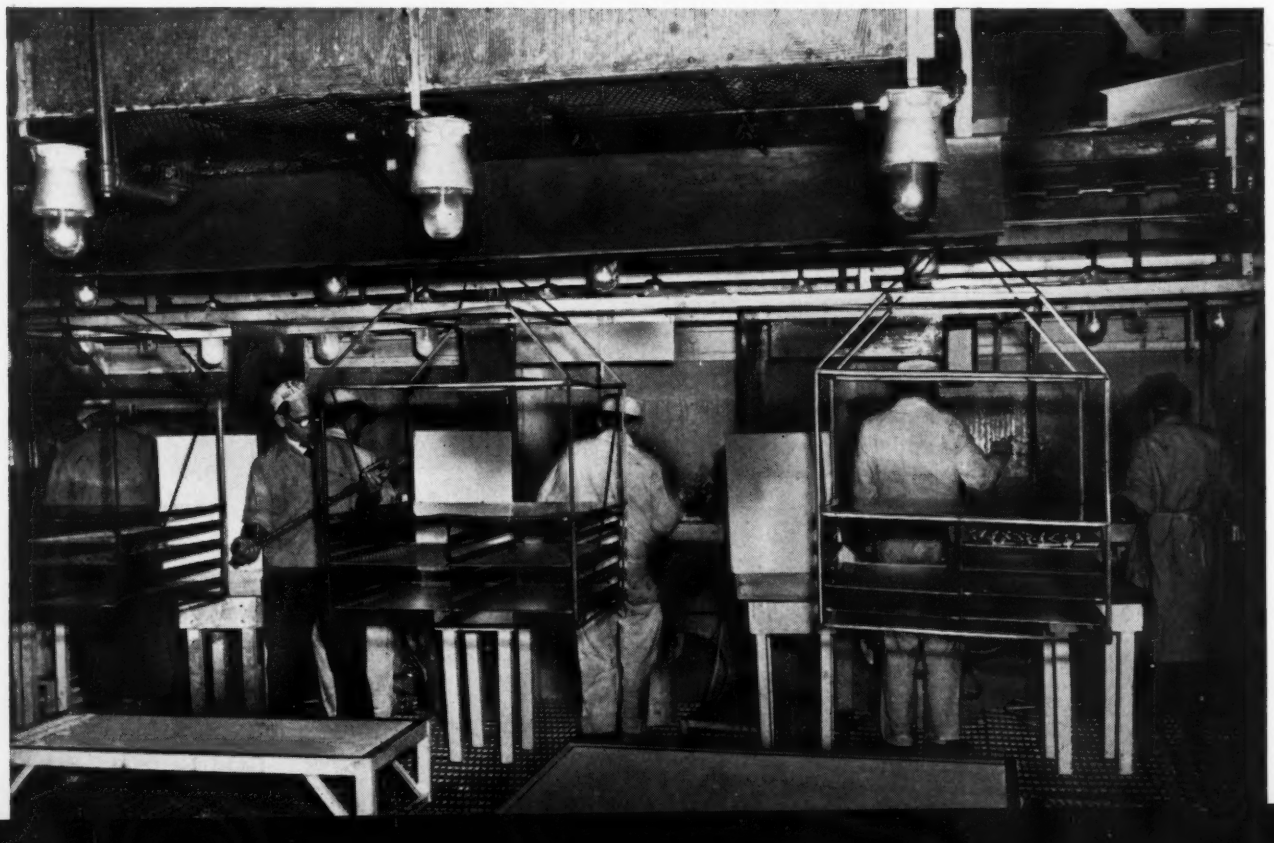
uniform work, closely conforming to the die contours.

Following the press work, three studs and two brackets are soldered to the back face of the escutcheon, after which the front face is buffed preparatory to nickel and chromium plating. Finally, the escutcheon is painted in three colors, which are sprayed on in a continuous operation.

A gray background accentuates the red letters "Hotpoint," and other small letters are painted white. This is done in the spray room illustrated in Fig. 6. An overhead trolley conveyor carries racks of work to operators at water-wash spray booths where the required series of operations is performed. After removing a rack of work from the conveyor, the first operator places an escutcheon in a jig type spraying stencil which quickly masks the areas that are not to be painted. The work is then passed along the line for the successive painting of different colors.

When the final color has been applied, the parts are loaded into racks and replaced on the conveyor, which carries them to the drying ovens. The first drying oven sets the paint sufficiently to permit the work to be handled for removing overspray. This is accomplished by rubbing with felt blocks, as shown in Fig. 7. A second oven-cycle bakes the paint to a hard finish. The same enamels as are used on refrigerators, ranges, etc., are employed for painting the escutcheons, in order to obtain a high degree of hardness, luster, and sheen.

Fig. 6. "Hotpoint" escutcheons are painted three colors in water-wash spray booths. An overhead trolley conveyor carries the work from operator to operator



Profits and Progress

Abstract of an Address Delivered at the Recent Westinghouse Machine Tool Electrification Forum Held in Buffalo, N. Y.

By TELL BERNA, General Manager
National Machine Tool Builders' Association

IT is an American trait, I think, never to be satisfied. Proud as we are of American machine tools, and the standing they have earned in every part of the world, any machine tool builder will tell you that he is constantly at work on improving his machines. The unofficial motto of our industry is "How can we do it better?"

The Machine Has Made Possible Our High Standard of Living

Occasionally we hear complaints that man is the slave of the machine. Let the facts speak for themselves. How does it happen that the nation with the most machines has the highest standard of living in the world? By what strange magic can the people of the United States enjoy comforts and luxuries which make them the envy of all others, and, at the same time, export to less fortunate nations as gifts or on long-term loans the products of American efficiency in factory and farm worth billions of dollars? Why is it that in every industry the adoption of better equipment means a wider market because of lower prices, and greatly increased employment at steadily increased wages?

There may be Americans who are indifferent to this miracle, but other nations are not. They not only scrape up all the precious dollars they can get to buy American machine tools, but they pay us the sincere compliment of doing everything they can to imitate us—by building up their own machine tool industries as fast as they can.

I hope, however, that they do not make the mistake of assuming that all they need is better machine tools. To be sure, just better machine tools will improve the quality of the product, will be safer for the operator and easier to run, and will enable even an unskilled man to earn far more than he could in any other way by increasing his production. But with the improved machine tool must go better shop conditions; better light and ventilation. It is necessary to study the problem of how to get the work into the machine and out of it; how to check the job quickly and accurately with modern gaging equipment, which I may add, is another field in which American industry holds the lead.

Above all, the basis of our progress is the free private enterprise system, which places a premium on better management and increased production per man-hour. Better machine tools are only a part, though an essential part, of this system, and a higher standard of living and greater opportunity for every citizen are its end products.

In any business there are two driving forces, the fear of loss and the hope of gain. Give a businessman the hope of a good profit, and he will devise new products; he will reduce his prices to find a larger market; he will incidentally benefit everyone—his stockholders, his customers, the United States Treasury, and his employes. For only a prosperous enterprise can pay high wages. Yet profits are suspect.

What are Profits and How are They Distributed?

What is the truth about profits? In the first place, when we study the matter, we run into a confusion of terms. We hear the expression "profits before taxes." Actually, the income of a corporation cannot be considered "profits" until it has paid for material, labor, management, and services; has recovered part of the capital invested in plant and equipment; and has paid its taxes. The residue is profit.

Just to make matters more complicated, we have in recent years been working with a shrinking dollar. This shrinkage in the value of the dollar results in an over-statement of profits. Unfortunately, the lessened value of the dollar affects the depreciation reserve as well. So this reserve is inadequate in time of increasing prices to maintain the productive capacity of the plant. Management must, therefore, set aside a replacement reserve in addition to the depreciation reserve, and this supplementary reserve must come out of profit after taxes. Because they pay taxes

on reported earnings, American concerns have overpaid their 1948 taxes. Standard accounting procedure and Treasury regulations have created a serious misunderstanding which weakens the nation's industrial strength and affords ill informed people a basis for attacking the very system of free private enterprise that has made us great.

Where do the profits go? Labor organizers would like them paid back to the workers. Politicians would like them to go into taxes. Actually, profits are used in three ways: In the first place, the company raises wages, which increases its costs and tends to reduce its future profits. Workers, therefore, have a direct interest in the prosperity of their company. Unfortunately, so much has been said and done to stress the conflict in interest between management and worker that most of us have lost sight of the fact that stockholders, management, and workers are all in the same boat. In the long run, they succeed or fail together.

Second, the stockholder must be paid for the use of his money. If this is not done, people will not save to invest their earnings. Instead of providing for their old age, they will rely on public charity to support them in their declining years.

The third part of the profits must go back into the business. Money is needed for research and design in order to stay in line with competition. In the machine tool industry, practically all the expansion over the years has come from earnings "ploughed back" to increase capacity. For the most part, the companies in this field are small. They could hardly hope to raise capital by selling stock.

Obstacles Created to the Building Up of Reserves by Government Regulation

Now this division of profits in three ways is made extremely awkward by a regulation of the United States Treasury known as Section 102. This provides that a penalty tax of 27 1/2 per cent on earnings up to $100,000 and 38 per cent on higher earnings, in addition to the corporate income tax, may be applied by the Treasury on the entire undistributed portion of the company's earnings if the company does not distribute as much as the Treasury thinks it should.

So the management of the company faces the danger that four or five years from now the Treasury will review its return for 1948 and impose this drastic penalty plus interest. Then the stockholders may bring suit against the board of directors for the dividends the Treasury says they should have had. In the face of that risk, management has a desperate choice—that of not building up reserves and going bankrupt in the next recession, or of building them up and being put out of business by the Treasury. The fact that Section 102 is not often invoked doesn't make much difference; it affects the distribution of profits in a way that seriously weakens American productive capacity.

Some Change Required in Our Practices to Perfect Our System of Government

No one contends that the free private enterprise system is perfect. It is flexible; it will grow and change. But it will not be helped by the well meaning efforts of people who do not understand it or who labor under certain misapprehensions. In the first place, it is ridiculous to assume that the way to raise the standard of living is just to pay everybody more money. As a nation, we can have more things when we produce more. Printing more dollar bills creates nothing.

There has been much discussion of the fact that the output per man-hour has increased, over past years, about 3 per cent per year. That is interesting as a statistical fact, but let's remember that this increase is not automatic. What are we doing to increase output per man-hour? That is the key to our problem, not reliance on a statistical abstraction.

Some of our practices must be changed. Let's stop singling out certain deserving groups for preferential treatment or subsidies from the public treasury. This merely encourages inefficiency. Let's stop attacking big business because it is big. This is a big country. Would 5000 independent telephone companies serve us better than the Bell System? Would forty small railroads do a better job for us than one huge Pennsylvania System? Let's stop shedding crocodile tears about the plight of Small American Business. Machine tool builders are small business by any definition. We find in big business our best customers. They treat us fairly. They pay their bills. We not only sell to them; we like to buy from them. Every time Congress takes a wild swing at "big" business it hits small business right between the eyes.

We seem to be frightfully concerned about "monopoly" and "cartels." Actually, we have few monopolies, and cartels are rare. Let Congress repair the Patent Office, and give small business the protection of a sound patent system—the greatest help Government can give the small businessman. But a patent is a "monopoly."

The free private enterprise system stands for

(Concluded on page 179)

Compression and Transfer Molds for Precision Plastic Parts

Features and Applications of the Basic Types of Plastic Molds and Factors Influencing Plastic Mold Design are Discussed in This Article, which is the First of a Series on Compression and Transfer Mold Design

By JOHN J. JOHNESCU
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Westinghouse Electric Corporation
East Pittsburgh, Pa.

THERE are a number of ways of classifying plastic molds. The method in most common use is to refer to them by types, such as compression molds, transfer molds, and injection molds. Another method of classification is based on the type of materials for which they are to be used; that is, molds for thermosetting materials and molds for thermoplastic materials. Such a classification immediately separates compression and transfer molds into one group, and injection molds into another. The former are more adaptable to the production of precision parts, using thermosetting materials, while the latter are used with thermoplastic materials when high production at low unit cost is desired.

Thermoplastic materials do not take a permanent set when subjected to heat and pressure, and the curing time, which is the time required for the material to harden, is usually quite short. The acrylic, styrene, and vinyl plastics, and nylon and ethyl cellulose are common examples of thermoplastic materials. They are plasticized by the application of heat and pressure.

The thermosetting materials, on the other hand, retain the shape in which they are cast because of a chemical reaction that takes place during the curing cycle. They require heat and pressure to plasticize them, and heat to harden them.

Of the two methods of molding thermosetting materials—compression and transfer molding—the former is the older and the more extensively used, due to the low cost of the mold. The molding compound is placed in a heated mold, with the inserts, if any, in position. After the compound softens and becomes plastic, the top block moves down and compresses the material to the required density by a pressure of 1/2 ton to 3 tons per square inch. Continued heat and pressure produce the chemical reaction that hardens the material.

The time required for curing or polymerization depends principally upon the size of the largest cross-section of the part and on the type of molding compound that is being used. Less than a minute or several minutes may elapse before the part is adequately cured and ready to be ejected from the cavity. The common method of determining whether or not a part has been properly cured is to test it with acetone. If there is no reaction to this test, the curing time has been sufficiently long.

Basic Types of Compression Molds

There are four basic types of compression molds, namely, positive molds, landed positive molds, semi-positive molds, and flash type molds,

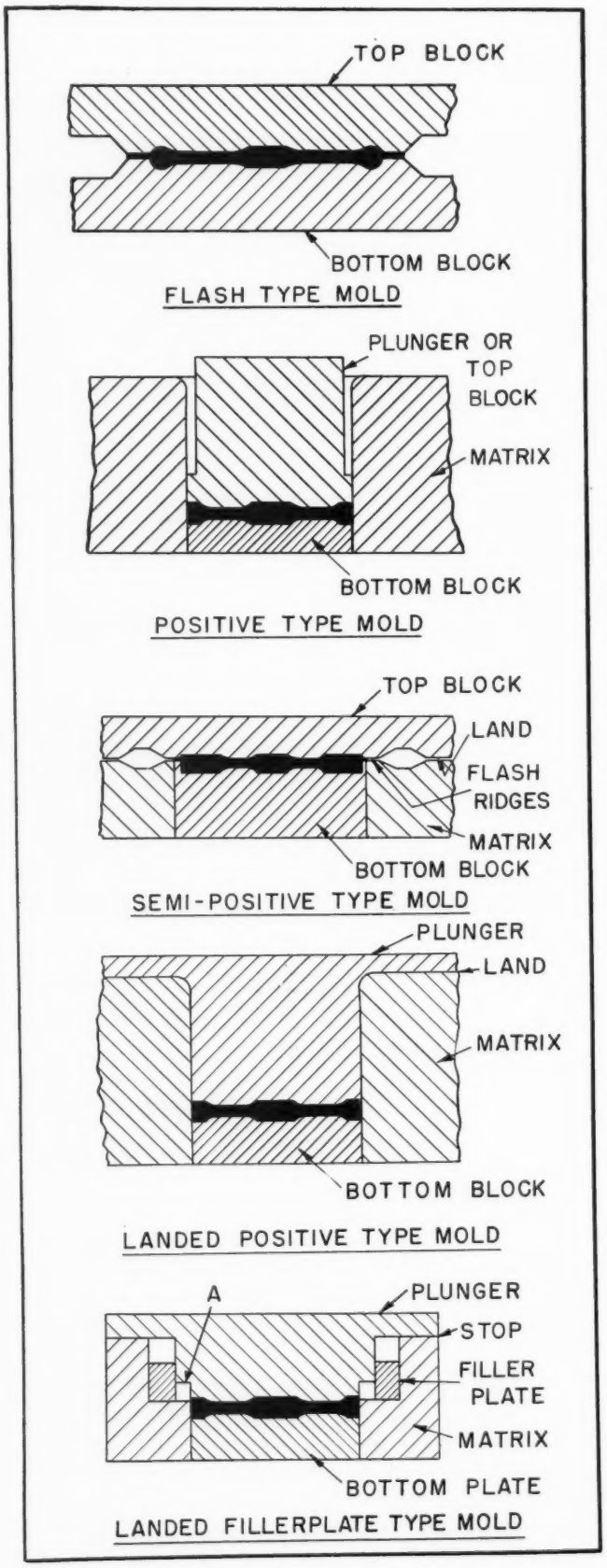


Fig. 1. The basic types of compression molds are positive molds, landed positive molds, semi-positive molds, and flash molds. The landed filler-plate flash mold is a variation of the semi-positive mold, and is widely used in industry

as shown schematically in Fig. 1. In a positive type mold, the plunger, or top block, acts directly on the charge. There are no lands or stops on the bottom block or on the matrix to limit the travel of the plunger. With the proper clearance between the bottom and top mold blocks, the molding material is completely trapped, and a dense part with good electrical and physical properties is obtained.

The amount of material in the mold cavity determines the thickness of the pieces. If a multi-cavity mold is used, the charges must be equal; otherwise, the parts will vary in thickness or in density. With a single-cavity mold, successive charges should be accurately weighed to insure that the parts will not vary. One way of overcoming these variations is to use plastic preforms. Besides insuring an accurate charge, they facilitate handling, and they can be preheated in a high-frequency generator to reduce molding time.

Another method of overcoming variations in mold charges is to increase the clearance between the top block and the matrix. During the molding cycle, a vertical flash or fin forms as the material flows into this clearance. This type mold is sometimes known as a positive flash mold.

A landed positive mold is similar to the fully positive type except that lands are incorporated in the design to stop the travel of the plunger at a predetermined point. However, the lands absorb the pressure that should be exerted on the part, and while the thickness of the part is accurately controlled, the density may vary considerably. Hence, the physical and electrical characteristics will vary.

In the flash type mold, flash ridges are added to the top and bottom blocks. As the top block, or plunger, exerts pressure on the material, excess material is forced out of the mold cavity and between the flash ridges, where it forms a very thin fin. As the two mold halves continue to come together this fin begins to cure, and since it is thin, it will harden much sooner than the main mold charge. The harder the flash or fin becomes, the more it prevents escape of the mold charge, until finally the flashing out process stops. This type of mold is widely used not only because it is comparatively simple to construct, but also because it holds part thickness and density within close limits. It is therefore well suited for use in applications where multiple-cavity molds are desirable, since it tends to equalize any slight difference that may exist between the weight of the mold charges.

The semi-positive mold actually is a combination of the flash type and landed positive type

molds. In addition to the flash ridges, a land is employed to restrict the travel of the plunger. While some of the force of the press is taken by the lands, much of it is exerted on the part being molded. The amount of clearance between the ridges regulates the thickness of the flash and controls to a large extent the density of the molded part.

There are, of course, variations of these four basic types of compression molds. For example, there is the landed filler-plate flash type mold shown in the bottom view of Fig. 1. This is in many respects similar to the semi-positive mold. The flash is horizontal and located at the top edge of the molded part. The plunger is relieved at *A*, so that there is no pressure on the flash ridges, but the flash is practically pinched off by the close clearance between plunger and matrix.

The plunger is restricted in its downward travel by stops that may be part of the mold matrix or the bottom mold block. The filler plate acts as a guide for the plunger and provides a deeper well for the material. However, in some cases, it may not provide a sufficient guide for the plunger, and guide pins may be required to line up the top and bottom mold members.

When the part to be molded is large, a loading plate may be used with any of the compression molds. This plate is bored to the same diameter as the plunger, and rests on the top of the bottom block or the matrix, but is carried up with the plunger, or top mold member, when the press opens. The advantage of using it is that the mold cavity can be made shallow, and machining or hobbing costs are thereby reduced. It may be necessary to make the mold in sections to release the molded part or to reduce mold manufacturing and maintenance costs.

A six-cavity, compression type, landed plunger mold for the production of a plastic handle for an electric roaster is shown in Fig. 2.

Material is loaded in each end of the bottom mold, the pressure of the ram forcing it to flow throughout the cavity. After curing, the mold is opened and the parts stripped by stripper pins extending through the top mold member. Cap-screws are used to hold the top and bottom mold members to the top and bottom steam plates, since the pressure required to open the mold is only a fraction of the molding pressure, and cap-screws are sufficient to hold the members in position.

As many as forty-eight cavities may be employed in a single mold, as shown in Fig. 3; or double-deck molds, which are multiple-cavity molds placed one above the other in the same press, may be economically used if the production of the part is large. These and other complicated molds will be discussed in a later article.

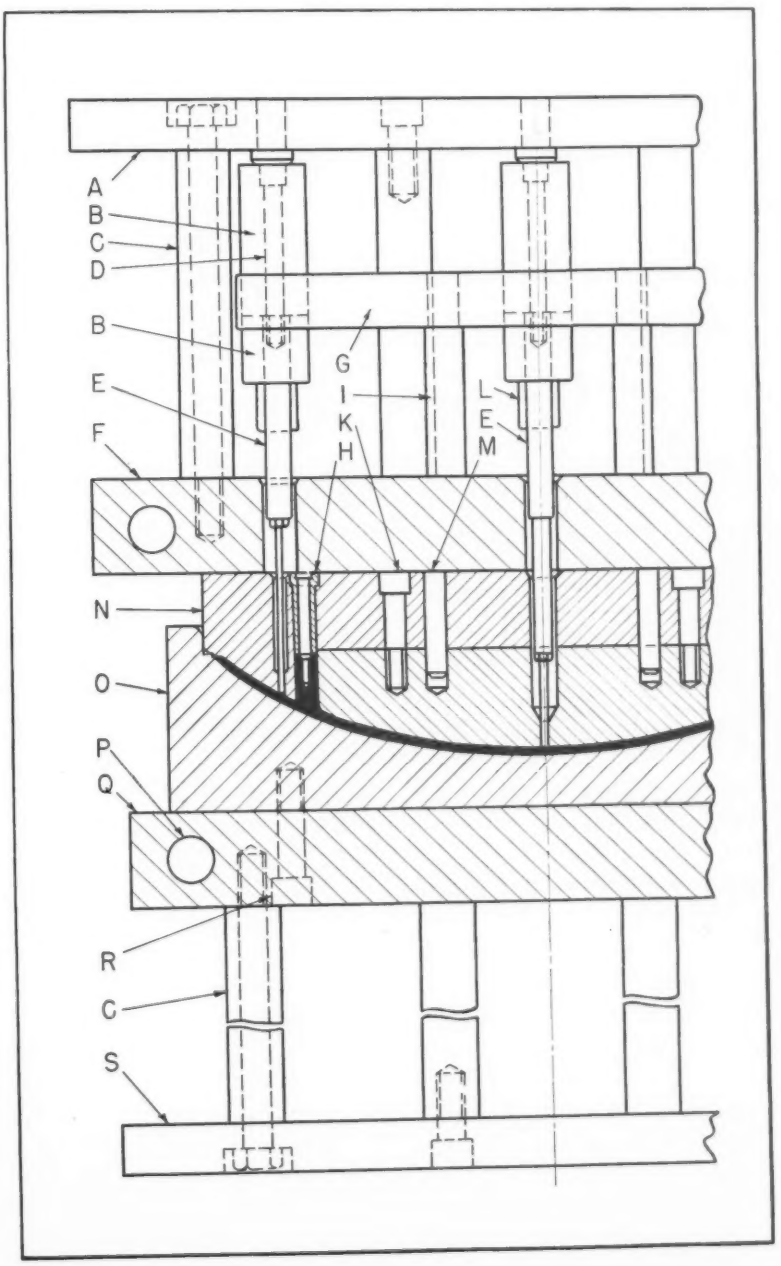


Fig. 2. Six-cavity, compression type, landed plunger mold for molding plastic electric roaster handles. The parts of this mold are as follows: (A), top mounting plate; (B), stripper plate; (C), parallel; (D), cap-screws; (E), stripper pin holder; (F), top steam plate; (G), safety strap; (H), mold insert; (I), safety pin; (K), cap-screws; (L), bumper pin; (M), dowel-pin; (N) top die; (O), bottom die; (P), baffle rod; (Q), bottom steam plate; (R), dowel-pin; and (S), bottom mounting plate

Fig. 3. When the anticipated production rate is high and the length of run is to be long, multi-cavity molds can be economically employed. A forty-eight cavity compression mold is shown in this illustration

Types of Transfer Molds

When a part of intricate shape containing delicate inserts is to be molded, it is usually preferable to use a transfer mold, since there is less tendency for the inserts to be deformed. Also, some dimensions can be made to closer tolerances in a transfer mold than in a compression mold.

Transfer molding acquires its name from the fact that the molding material is loaded in a reservoir and is forced through orifices into the mold cavities by the application of heat and pressure. The heat and pressure must be maintained for a definite time in order for the chemical reaction (curing) to take place. The time, as in compression molding, depends upon the cross-section of the molded piece and the type of molding material.

Transfer molds are higher in cost than the compression type, and some sections of the molded part may be weak, due to incompletely filled sections. The flow may introduce sectionalizing and internal stresses that will result in a weak or warped section. However, in many cases, the advantages of transfer molding far outweigh its disadvantages.

Basically, there are two types of transfer molds—the conventional sprue type transfer mold and the positive plunger type transfer mold, illustrated in Fig. 4. In the former, the loading chamber is connected to the gates by a sprue. The plunger acts directly on the material, forcing it through the sprue and gates and into the molding cavities. When the part is cured, the press is opened and the cull and sprue are removed from the key machined on the plunger.

At the Westinghouse plant, the sprue type transfer mold has been superseded by the positive plunger type transfer mold, except in rare cases. This has been done because the latter type of mold is less complicated, and therefore costs less; is easier to maintain; requires less material; and results in lower part cost. With the positive plunger type mold, the material is loaded into a transfer cylinder and is forced directly through the gates by a plunger attached to the press ram. Thus, the transfer chamber and retainer that are required on the conventional sprue type transfer mold are eliminated.

Another advantage of the use of a plunger type transfer mold is that a smaller press can be employed. The clamping pressure for a transfer mold is quite high, varying with the material being molded, but might be, say, 4 tons per square inch of projected mold area for an average condition. The total press tonnage must equal the projected area of the piece, the runners, and the loading chamber multiplied by the clamping pressure, in tons per inch. When a sprue type transfer mold is used, the projected area of the sprue and of the additional gate lengths must be included in this calculation. In one instance, a press rated at 97 tons was sufficient with a plunger type mold, while one rated at 116 tons was required for a sprue type mold.

Design of Plastic Molds

The design of a plastic mold starts with the design of the part to be molded, and the first step is the selection of the material that is to be used. This selection directly affects the type of mold to be employed and its various design characteristics. Bulky unpreformed materials require a greater mold depth than more dense types. The

shrinkage of the material on curing will determine the mold dimensions, and the differences in the flow characteristics of the molding compounds may be the deciding factor in determining whether a transfer type or compression type mold is to be employed.

The principal thermosetting plastics in use at the Westinghouse plant contain a resin, such as phenol formaldehyde, urea formaldehyde, or melamine formaldehyde, that acts as a binder for the filler; a filler that imparts bulk to the part and determines to a large extent the properties of the plastic; and modifying agents, such as dyes, pigments, lubricants, accelerators, and plasticizers. Thermosetting molding compounds of the phenol-formaldehyde type constitute the largest class of compounds used. They are compounded to rigid specifications, and are known under the trade name of "Moldarta" plastics.

Of the fillers employed, a wood flour is the most common. This results in a general-purpose plastic of good moldability and relatively low cost. A typical plastic with a wood-flour filler would have approximately the following properties: Specific gravity, 1.35 to 1.40; tensile strength, 6000 to 7000 pounds per square inch; flexural strength, 8000 to 10,000 pounds per square inch; impact strength, 0.30 foot-pound; dielectric strength, 300 volts per mil; maximum heat resistance, 125 degrees C.; and shrinkage, 0.006 to 0.008 inch per inch. Mixtures such as Bakelite-BM-3200 or BM-14316, Durez 791, and Durite 528 would be classed as general-purpose mixtures.

For greater mechanical strength utilizing a cellulose filler, cotton flock can be employed. This filler is produced from cotton linters, and will result in parts with properties similar to a wood-flour filled mixture except that the impact strength will be increased. Durez 1905 and Monsanto 3941 belong to this class of mixtures.

For better resistance to impact, a cotton-cloth filler consisting of cloth chopped into sections about 1/2 inch square can be processed with a phenolic resin. The average impact strength of this material will be 1.5 to 2.5 foot-pounds. Tensile strength and dielectric strength may be reduced slightly, but such a reduction is acceptable in most applications in view of the improved shock resistance. A material such as Bakelite BM-3510 falls into this group.

For increased heat and fire resistance, an asbestos fiber may be used as a filler. When molded, this material may be expected to have the following characteristics: Specific gravity, 1.80; tensile strength, 6500 pounds per square inch; flexural strength, 10,000 to 12,000 pounds per square inch; impact strength, 0.90 foot-pound; dielectric strength, 150 volts per mil; water absorption, 0.36 per cent; maximum heat resistance, 175 degrees C.; and shrinkage, 0.0023 inch per inch. Bakelite BM-250 is in this class.

Still another group of materials may be employed for the molding of parts with superior dielectric characteristics. These are usually mica-filled materials, and are quite weak mechanically. The average properties are: Specific gravity, 1.70 to 1.80; tensile strength, 4800 pounds per square inch; flexural strength, 8000 pounds per square inch; impact strength, 0.32 foot-pound; dielectric strength, 325 volts per mil; power factor at 10^6, 0.01; water absorption, 0.09 per cent; maximum heat resistance, 110 degrees C.; and shrinkage, 0.0022 inch per inch. Materials such as Durez 11836 and Monsanto 7934 are in this group.

In addition to these more commonly employed plastics, a wide variety of materials is available that are more or less custom blended to fit a particular job. Slate, silicon, soapstone, or clay may be selected as a filler material to improve the part appearance or other characteristics. Mineral fillers may be specified to increase the wear of the mold or the wear of tools, such as cutters, saws, drills, or taps, when further forming after molding is required.

Materials having short-fiber fillers result in a low-cost part, while materials with long-fiber fill-

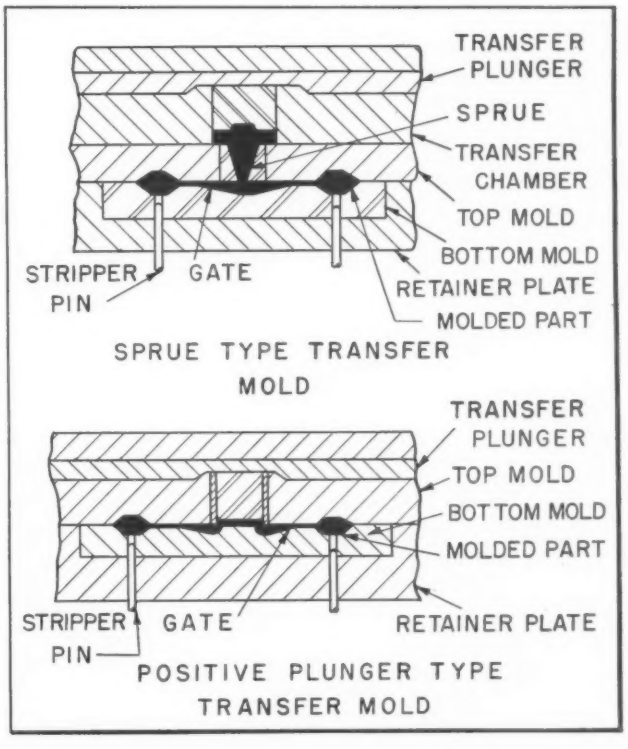


Fig. 4. Transfer molds can be of either the sprue type or the plunger type. With the latter type, mold costs and part costs are less and the design of the mold is less complicated

ers having greater impact resistance make the part more expensive. It is therefore uneconomical to select a material with better impact resistance than is required for the application.

The following step-by-step procedure will help in selecting the most suitable material to be used for any particular application.

Westinghouse Electric Corporation
Quotation on Molded Parts

1. Negotiation No. .....
2. Name of Part .....
3. Drawing No. ..... Sub. No. ..... Line.....
   Item No. .....
4. Style No. .....
5. Division, Location, Dept., Person .....
6. Forward Quotation to: .....
7. Quantities Required: Annually .....
   Monthly ..... Daily .....
8. Material Specification No. .....
9. Tool Costs:

	Method No. 1	Method No. 2	Method No. 3
A. Mold			
B. Preform Mold			
C. Loading Board			
D. Stripping Fixture			
E. Cooling Fixture			
F. Machining Fixture			
G. Grinding Fixture			
H. Punch Fixture			
I. Drill Jig			
J. Drill Head			
K. Gages			
L. Tool Design			
M. Insert Fixtures			
N. Total Tool Cost			

10. Mold:

Mold	Method No. 1	Method No. 2	Method No. 3
A. Kind			
B. Type			
C. No. of Cavities			
D. Press Tonnage			

11. Preforms
    Type ..... No. per Pc. ..... Press .....
12. Preheating
    Method ..... Time .....
13. Production Time
    Baking (Min.) ..... Cooling (Min.) .....
14. Daily Production
    Per Hour ..... Per Day .....

Fig. 5. The form shown is used to estimate the cost of a mold for producing a specific part. Several molding methods are compared in order to obtain the least costly design. Other forms are used to check the accuracy of mold design and set-up production procedures

1. Analyze carefully the requirements of a new application and the conditions under which the part has to operate. Determine if mechanical strength, impact resistance, electrical properties, and heat resistance are of primary importance.

2. Use the data in the handbooks of the various plastics materials manufacturers as a general guide. Compare the values of several materials in order to choose the one that comes closest to the requirements.

3. Estimate the working stresses that the part will be subjected to in use.

4. Determine the required minimum sizes of the cross-sections of the part to be designed, using the property values of the material that is selected. Calculate the strength of the cross-section, using a minimum safety factor of 4 for the mechanical properties and of 6 for the electrical properties. These safety factors must be increased by the designer, depending upon the importance of the molded part in the functioning of an assembly, the accuracy of the estimates of the working stresses involved, and the deterioration or decrease of the test values given due to conditions at the place of use.

When the actual design of the part is undertaken, the molding department and the tool design department should be called upon for advice. Designers who have not had much experience with plastic molded parts are likely to specify tolerances that are closer than necessary; make the wrong selection of materials; design complicated sections instead of simplifying the part as much as possible; disregard an allowance for taper on the part; provide walls that are too thick or too thin for practical molding; neglect to rib the part for strength or groove it for lightness; decrease the strength of a section by deep counterbores; fail to acquaint the mold designer with the function of the part and the method of assembling it; specify radii on the parting line; and overlook the need of providing radii to increase the strength in other sections.

It is imperative that the mold designer know where the part is to be used, how it is to be assembled, and what its physical, electrical, and chemical properties must be. For only by a thorough knowledge of the application can he intelligently criticize the part design. In many cases, it is possible to reduce the cost of a mold by allowing slightly greater tolerances or by modifying the part so that it can be molded in a different position—a factor that may affect the type of mold specified and the ultimate cost of the part.

If the part is to be produced in quantity and its design is to remain the same for a long period

of time (perhaps three to five years), an expensive mold may be justified. All designs should be based on an anticipated monthly or bimonthly production rate and on the types of presses—fully automatic, semi-automatic, or manually operated—that are available.

When all these factors have been evaluated, it is possible to make a preliminary estimate of tool cost and to estimate the anticipated cost per part. For this purpose, a form such as shown in Fig. 5 is used at the Westinghouse plant. Most parts can be molded in any one of several different ways, and it is therefore advantageous to determine the part cost for different types of molds. A mold designer and machine shop foreman, in cooperation with a methods engineer, estimate the mold cost, using as a base the standard time-study data that has been accumulated from previous performance. The methods engineer and time-study men can predict the cost of manufacturing the part, and the materials engineer can foretell quite accurately the cost of plastic materials to be used in producing the piece. After several different methods have been compared, then, and only then, is the design of the mold authorized.

Close cooperation between the design and manufacturing departments and the customer continue until the mold is completed. Mold cost varies to a great extent, and is dependent upon many different factors. A very simple type mold may cost as little as $200, while a more complex type may have a cost around $8000 to $10,000. From this it can be seen that unless there is close cooperation between everyone involved, a major loss may be suffered by the tool department.

* * *

Film on the Generation of Metallic Bearing Surfaces

The Micromatic Hone Corporation has produced a 16-millimeter sound film entitled "A Film Report on the Generation of Metallic Bearing Surfaces," which analyzes bearing surfaces and the methods used in generating them. In twenty scenes, the film describes a bearing surface in terms of its finish, character, structure, and accuracy, and then shows how a metallic bearing surface is generated. It concludes with the results achieved by various processes, and comparative methods of controlling the accuracy and surface finish, including the technique of the honing process. The film is available to technical or trade organizations upon request to the Micromatic Hone Corporation, 8100 Schoolcraft Ave., Detroit 4, Mich.

Profits and Progress

(Continued from page 172)

adventure, and adventure implies risk. It pays a premium for hard work, and some of us find that painful. But have we reached the point as a nation where we prefer security and a low standard of living to taking a chance and doing some hard work?

The alternative is plain. For the combined judgment of millions of Americans, constantly deciding for themselves whether to buy or not to buy, whether to sell or not to sell, whether to start a new business venture or work for someone else, we substitute the judgment of several million bureaucrats. They don't know anything about your business until you tell them. To the overhead of every industry, they add the cost of a vast bureaucracy.

When the welfare state takes over an industry, it does not remove duplications or combine and relocate plants for greater operational economy. It merely superimposes a hastily assembled bureaucracy on the industry. As long as operating losses can be met out of the public treasury, there is no incentive to improve efficiency or increase output. There is no spur on management to avoid a loss or to gain a profit.

Free Private Enterprise is the Basis of Our Progress

Perhaps you agree that full employment is the first objective of a modern state. Take the Soviet Union. There is no unemployment there. None of the periodic recessions of the inefficient, disorderly, competitive free private enterprise system. No nasty profits. Just one long, continuous, automatic, self-continuing depression.

We have found a way that leads to greater heights than any nation has ever scaled. It has been a hard upward climb. We have not reached the summit. Shall we now retrace our steps? Have we lost the spirit of daring and adventure? Shall we follow blindly in the footsteps of these welfare states and dictatorships that are wallowing in a morass of bitterness and disillusion?

Give American citizens the facts and they will choose. We need a Government that has integrity. We need a Government that will tell its people the truth. We need a Government that will try to give equal justice to all citizens—not shower gifts on a few chosen groups. We need leadership from businessmen who know these things and will "sell" free private enterprise to their fellow citizens. We have a job to do, let's stop daydreaming and go to work.

Engineering News

Instrument for Testing Magnetic Properties of Steel

A measuring instrument known as a recording torque magnetometer has been designed in the Research Laboratory of the United States Steel Corporation for quickly testing the magnetic properties of different types of steel in order to determine their suitability for various applications. It measures the inherent magnetic property of any steel in a matter of six minutes. By the use of this instrument, it can be quickly determined whether a particular steel can be cupped to cap a ketchup bottle; formed into deep shapes, such as automobile fenders and bodies; or used in electrical transformers or motors. It is applicable in either mill or laboratory.

This instrument is similar to a horseshoe magnet in construction, two strong electromagnetic coils being placed end to end with a short gap between them. A specimen disk is mounted horizontally between the coils and rotated one-half revolution in six minutes. Beneath the sample and attached to its support is a strain gage which measures the twist toward the preferred direction of the sample's tiny magnetic particles. The measurements are then automatically recorded in an accurate curve plotted on a graph.

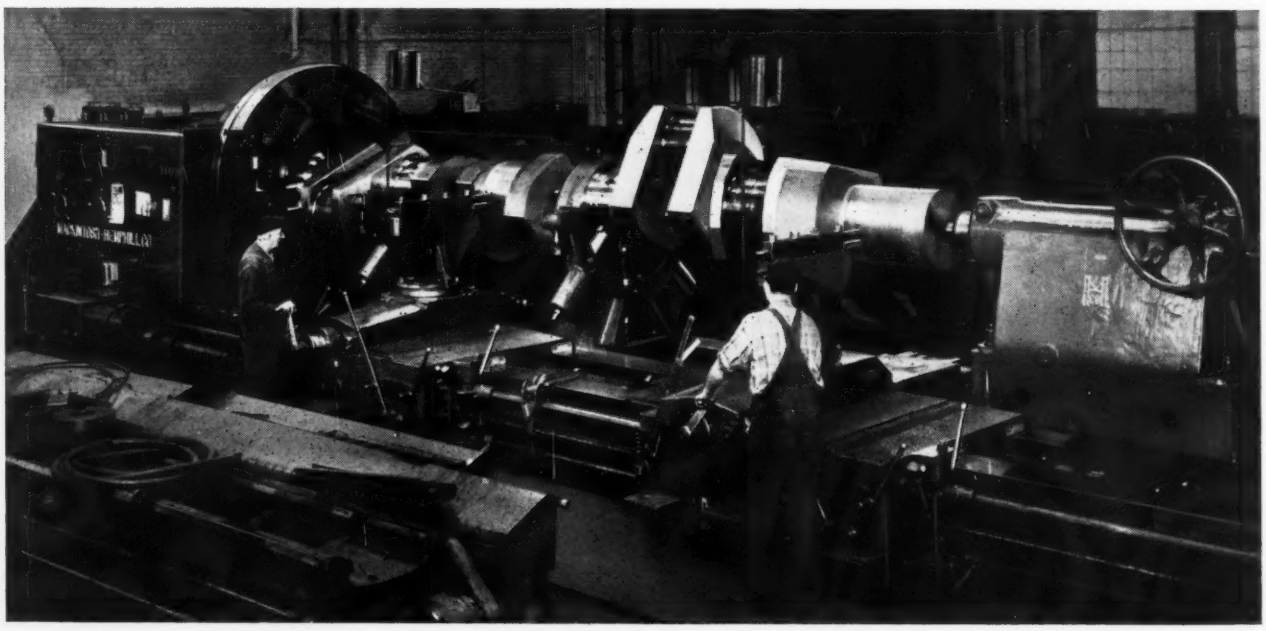
Frozen Mercury Patterns Used in Precision Casting

Castings up to 60 pounds in weight that conform to specified dimensions within plus or minus 0.0015 inch per linear inch are being produced by a new precision metal-casting process that employs patterns of frozen mercury. The mercury pattern is frozen at a temperature below —40 degrees F. It is then coated with a liquid ceramic while still at a low temperature. The mercury is melted and poured out of the ceramic mold prior to a casting operation.

Miniature Variable-Ratio Speed-Changer

A speed-changing device that weighs less than 6 ounces and is so small that it can be hidden inside a man's hand is a recent development of the Metron Instrument Co., Denver, Colo. This device can deliver up to 70 ounce-inches of torque and 0.025 H.P. Operating speeds up to 20,000 R.P.M. are practical. The ratio of input to output speeds is infinitely adjustable over a total speed range of 36 to 1. The device is intended for application to such equipment as business machines, recorders, controllers, etc.

Turning one-half of a crankshaft for a ten-cylinder Diesel engine in the plant of the Nordberg Mfg. Co., Milwaukee, Wis. This giant stationary Diesel engine has a 29-inch bore, a 40-inch stroke, and a rating of 7100 H.P. The five-throw crankshaft section shown being turned is a single forging about 23 1/2 feet long, weighing approximately 22 tons. An 84-inch by 50-foot Mackintosh-Hemphill lathe is used for turning the journal bearings and crankshaft cheeks. The lathe headstock is driven by a 75-H.P. motor



Machining Sintered Powdered-Metal Bearing Materials

By E. J. WELLER
Schenectady Works Laboratory
General Electric Co.

SHARP tools are an absolute necessity if porous iron and bronze powdered-metal bearings are to be properly machined after pressing and sintering. With sharp tools, parts may be made to specified tolerances, the finish will be satisfactory, and surface porosity will allow the free passage of lubricants to the bearing surfaces. On the other hand, if the cutting edges of the tools are allowed to become dull, the results can hardly fail to be inadequate.

Relatively light cuts and light feeds are best used for this type of work. Either high-speed steel or cemented-carbide tools can be employed. However, carbide tools, especially in the harder grades, are preferable because they will hold sharp cutting edges for longer periods of time.

Coolants and lubricants should not be used on any machining operations except burnishing. This is because they may displace the lubricant in the bearing and "sweat out" in service, thus causing trouble later. A coolant or lubricant may also mix with the chips and cause lapping of the cutting edges of the tool. A low-pressure air blast will be found useful in removing chips from the work, and will help cool the tools.

Although the same principles apply to all machining operations, specific techniques are, of course, required for individual operations. In drilling, for instance, drills with a low helix angle, and, in some cases, with a left-hand spiral, should be used to prevent the drill from digging in. The cutting edges of right-hand spiral drills should be stoned to provide a low rake angle.

High-speed steel drills are best operated at a surface speed of approximately 70 feet per minute, while carbide drills produce satisfactory holes at 200 or more feet per minute. Whenever possible, mechanical feeds should be used to avoid the surface rubbing that may occur with hand-feeding. The following feeds have been found satisfactory:

Drill Diameter, Inch	Feed, Inch per Revolution
1/8 to 1/4	0.002
5/16 to 1/2	0.004
9/16 to 3/4	0.006
13/16 to 1	0.010

These feeds may have to be modified to achieve the desired finish, especially for the larger sized drills, and for final sizing operations.

For tapping holes in powdered-metal parts, two-flute, left-hand spiral-point taps are recommended on diameters of 5/16 inch and smaller, and three-flute taps of the same type on diameters from 5/16 to 1/2 inch. The use of spiral-point taps is advantageous in tapping these materials because the chips are thrown ahead of the tap and are not pushed into the pores of the material. Conventional tap-drill charts should be followed to maintain approximately 65 to 75 per cent of thread.

Left-hand spiral reamers should be used when holes are to be reamed in these materials. For ideal conditions, the diameter of the drill should be smaller than the diameter of the reamed hole by the amounts indicated in the following:

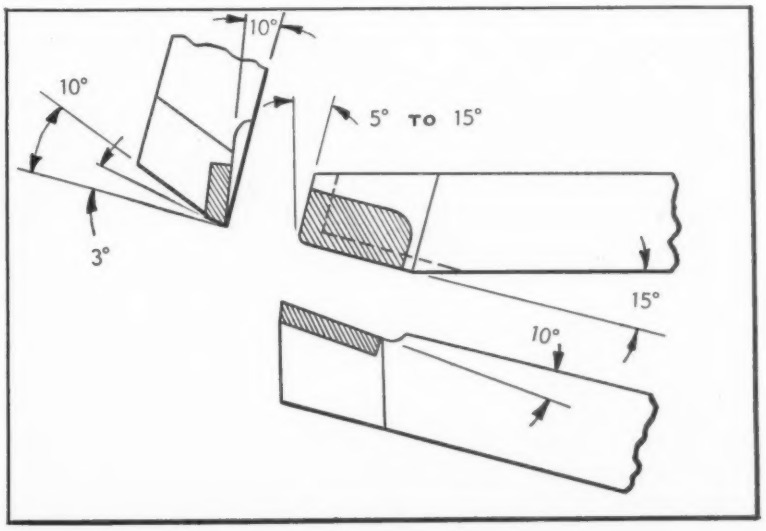


Fig. 1. Design of single-point carbide-tipped tool for turning sintered powdered-metal bearings

Fig. 2. Sintered bronze powdered-metal bearing before any machining operations have been performed on it

Hole Diameter, Inch	Drill Undersize, Inch
1/4 or less	0.002
1/4 to 1/2	0.002 to 0.004
1/2 to 1	0.004 to 0.006

Reamers should be run at a cutting speed of 25 to 50 feet per minute. Feeds per revolution that have been found effective are:

Hole Diameter, Inch	Approximate Reamer Feed, Inch per Revolution
Up to 1/4	0.005
5/16 to 1/2	0.007
9/16 to 3/4	0.010

It has been found advisable to use reamers in floating holders whenever possible.

Porous bearing materials are best turned and bored at speeds and feeds in line with normal finishing practice. This means that with high-speed steel tools, cutting speeds of approximately 90 to 110 feet per minute can be used, while with carbide tools, speeds of 175 to 350 feet per minute are practical. Feeds are limited by the shape of the tool used. For example, if a tool having a 1/16-inch nose radius is employed, a feed of 0.010 to 0.015 inch per revolution will be suitable. If the nose radius is decreased to 0.010 inch, the feed should be reduced to 0.003 to 0.005 inch per revolution in order to obtain a smooth, clean-cut surface.

This practice, of course, may be modified for roughing operations or when a porous surface is not required. For roughing operations, speeds of 500 feet per minute are not excessive with carbide tools if they are within the capabilities of the machine and are compatible with the size and shape of the part and the surface finish requirements. Feeds for roughing may be as high as the limits of the part dictate; a feed of 0.030 inch per revolution may not be excessive, depending upon the application.

After grinding a tool, all cutting faces should be carefully honed to provide keen, smooth edges. Fig. 1 shows how a carbide boring or turning tool should be ground.

A pressed and sintered bronze bushing is shown in Fig. 2 before machining. Fig. 3 shows the same bushing after the outside diameter has been turned with a sharp carbide-tipped tool having a 5-degree clearance angle. The surface

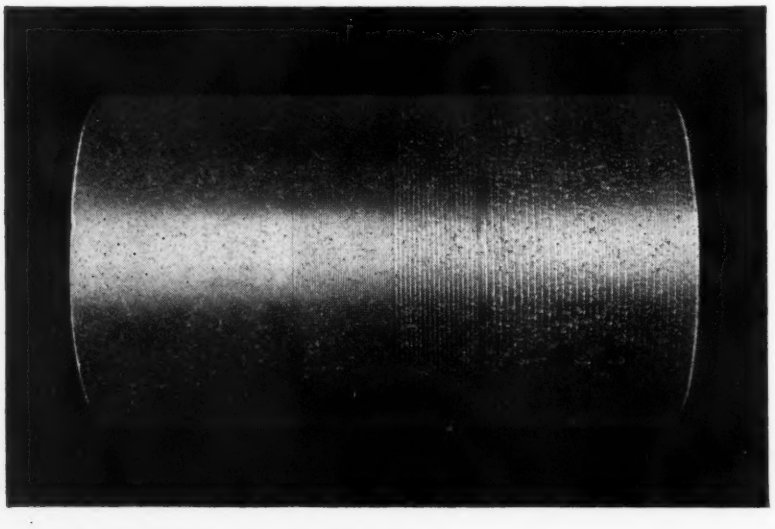


Fig. 3. Sintered bronze powdered-metal bearing after turning at four different feeds with a sharp tool. Porosity of surface was maintained at each feed

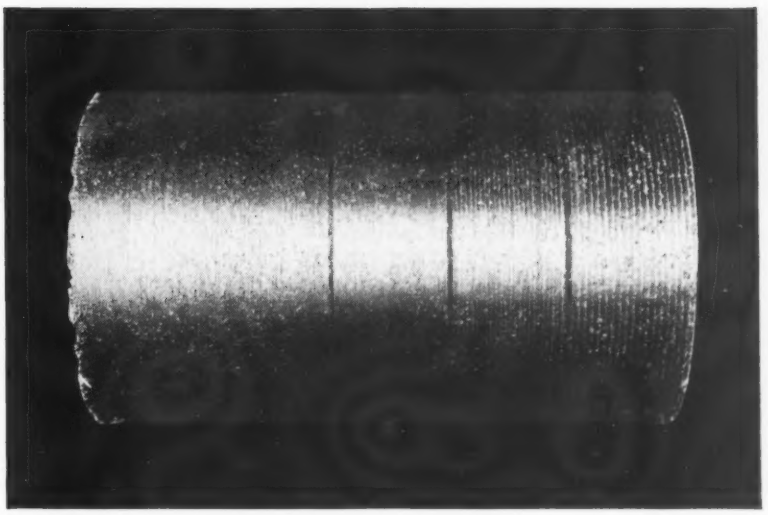


Fig. 4. Bearing shown in Fig. 3 after turning with a dull tool, which considerably reduced the porosity

porosity of this part was maintained with this tool at each of four different feeds. Using a dull tool with the same clearance angle and at the same four feeds, the surface porosity was considerably reduced, as shown in Fig. 4.

Milling cutters with carbide-tipped teeth are recommended for use on pressed and sintered materials. It has been found advantageous to have these teeth set in a helical position, so that the chips will shear off cleanly. For a small run, parts made of powdered metal may be machined with the same cutters that are used on cast iron, bronze, and other materials of low tensile strength.

As in the other machining operations on this type of material, particular attention should be paid to keeping the tools sharp. Corner radii should be held to a minimum, and a corner bevel is preferable to a radius.

It has been found that high-speed steel cutters are best operated at approximately 70 feet per minute, and carbide cutters at about 250 to 300 feet per minute for general-purpose work. Carbide-tipped cutters should be used whenever possible, in order to maintain size and finish for a long period between grinds. In milling powdered-metal parts, it has been found advantageous to replace the cutters when a flat 1/64 inch wide is worn on the back of the tooth or when any appreciable wear on the cutting edge appears. Failure to change cutters will result in a work surface that will retard oil passage.

A feed of 0.010 to 0.015 inch per tooth has been found most effective for roughing work with these cutters. For finishing, feeds of 0.002 to 0.005 inch per tooth should be used. Many operations can be performed better by climb or "down" milling with the same speeds and feeds as mentioned, but caution should be exercised to make sure that the parts are held firmly and that there is no table backlash.

Tools ground in the manner shown in Fig. 5 can be used effectively as a starting point when machining powdered-metal parts on a shaper. The top speeds available on most shapers may be used if the nature of the work permits. On ma-

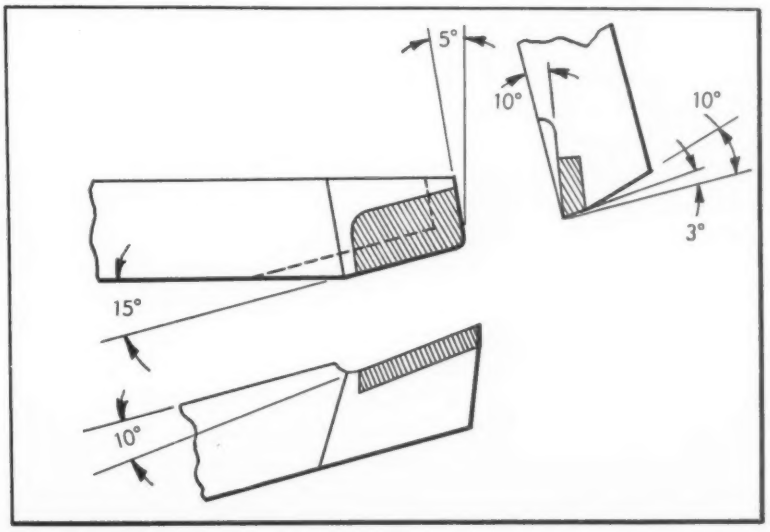


Fig. 5. Design of carbide-tipped tool for machining powdered-metal parts on a shaper, showing method of grinding relief and clearance angles

chines in which the tool is not lifted automatically on the return stroke, it is necessary for the operator to lift the clapper-box by hand or provide a means for doing so automatically. Otherwise, the tool may become chipped, and the work will be marred as the tool is returned to the starting position.

Many shapers have feeds that are too coarse to provide the necessary finish on powdered-metal parts. When this situation is encountered, the tool shown in Fig. 5 should be tilted or the relief on the heel changes from 5 degrees to approximately 2 degrees, so that the heel barely clears the work. The cuts should then be allowed to overlap, so that the tool will remove its own feed marks.

Grinding and lapping of porous powdered-metal parts have not been found practical, since particles of abrasives may become embedded in the pores, dislodging in service and destroying the bearing surfaces. Burnishing is recommended for fits between bearing bores and shafts when the limits of the fit are 0.0005 inch or less. Burnishing is best done after the bushing is assembled in the housing, since assembly operations may distort the bore.

In burnishing, a maximum of 0.002 inch on the diameter should be removed. A smaller amount is preferable, only enough material being left in the bore to insure that burnishing will clean up the surface. The greater the amount of stock removed by burnishing, the greater is the tendency to destroy surface porosity.

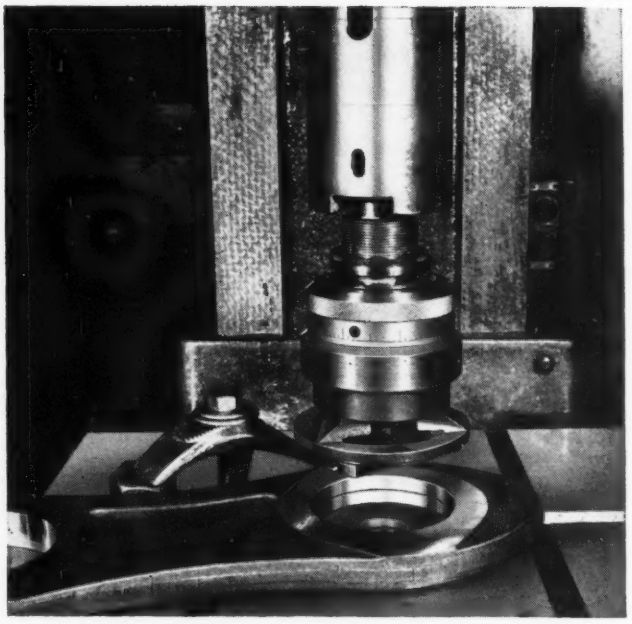
* * *

Motion Pictures on Contour Sawing and Precision Measuring Instruments

Eight industrial films have been announced by the DoAll Co., Des Plaines, Ill. Four of these are 16-millimeter sound motion picture films dealing with the following subjects: "Versatile Contour Saw"; "Sawing an Internal Irregular Shape"; "Filing an Internal Irregular Shape"; and "Gage Blocks and Accessories." The other four pictures are 35-millimeter sound-slide films, entitled: "How DoAll Gages Are Made"; "Theory Behind the Use of DoAll Gages"; "How DoAll Gages are Used"; and "DoAll Precision Accuracy with the DoAll Inspection Laboratory." Engineering societies, schools, and industrial plants can obtain copies of these films without charge by communicating directly with the company at the address given above.

* * *

Some alloys of stainless steel are non-magnetic. Other grades are magnetic.



Automatic recessing tool employed in cutting a grease groove around bores at opposite ends of large drop-forged links

Grooving Internal Bearings with Automatic Recessing Tool

A grease groove is cut in internal bearings at opposite ends of large drop-forged steel links at a high production rate in the plant of the Foote Bros. Gear & Machine Co., Chicago, Ill., by the use of a Scully-Jones automatic recessing tool, as shown in the illustration. Each bore of the link is 4 1/2 inches in diameter. The links are made of S A E 1045 steel, heat-treated to 240 Brinell. In cutting the groove, the tool is operated at a speed of 100 R.P.M.

The tool is located for the operation by means of a pilot collar which rests on the machined surface of the link adjacent to each bore. When the tool is properly positioned, it is automatically expanded in a radial direction for cutting the groove to the desired depth. At the end of the operation, the tool is quickly retracted for withdrawal from the bore. Graduated stop-collars provide a fine adjustment for both the location and diameter of the groove.

* * *

Material for Repair of Concrete Floors

Concrete floors can be rapidly repaired by the use of a new material known as "Tampatch," which was developed by the United Laboratories, Inc., Cleveland, Ohio. It is applicable to broken or rough interior or exterior concrete surfaces. One of the advantages of this new product is its ability to withstand heavy traffic loads. In addition, the floor may be placed in service almost immediately after repairing.

Production Jig Boring to Close Tolerances

By GEORGE H. DeGROAT

SMALL manufacturing shops engaged in short-run production of precision work, as well as large plants which produce interchangeable parts on a quantity basis, make extensive use of jig boring machines. These machines are widely employed for boring, drilling, reaming, and inspecting precisely located and machined holes both in production parts and in such tools as dies and jigs. A typical production job performed on a jig boring machine is described in the following.

The part illustrated in Fig. 1 is an aluminum-alloy supporting arm for the "Panto-Crush" grinding wheel dresser made by the Moore Special Tool Co., Inc., Bridgeport, Conn. The dimension between the centers of the holes in the two bosses is held to a total tolerance of 0.0002 inch to insure a high degree of accuracy between pivot points in the wheel-dresser. Precision bearings are installed in these holes so that their diameters are also held to the same tolerance.

Originally, this part was machined on a boring mill. The webs between the bosses were first milled to form locating surfaces, after which the work was clamped on the boring mill for machining the surfaces indicated by cross-hatching in the illustration. The time required for machining each part in this manner was 3 1/2 hours.

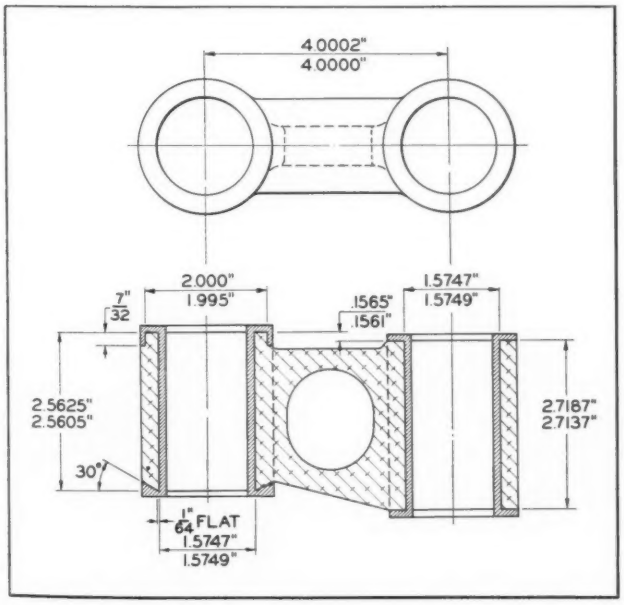


Fig. 1. The time required for machining the cross-hatched areas of this aluminum-alloy part was reduced from 3 1/2 hours for each piece to 22 minutes apiece by the use of a jig borer

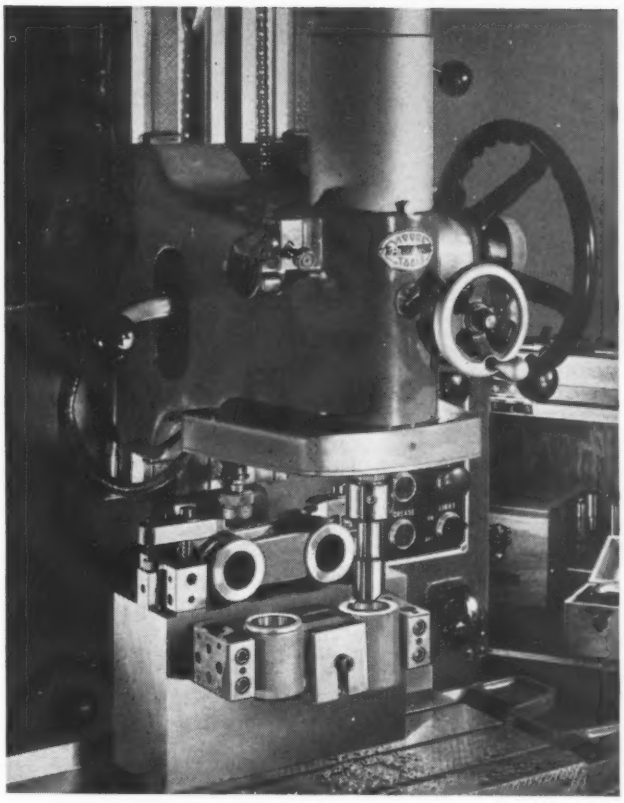


Fig. 2. In this jig borer set-up, a simple fixture is used which provides a milling position and a boring position for machining the part illustrated in Fig. 1

Performing the same operations in the Model No. 2 jig borer recently developed by the Moore Special Tool Co., takes approximately one-tenth the time previously required. As may be seen in Fig. 2, a simple fixture holds two parts in this machine. One part is positioned for milling the ribs, and the other for boring. Beginning with milling, ten operations are performed on each of 100 pieces. The milling operations are accomplished by a single-point fly cutter, held in a 2 1/2-inch solid boring-bar, using a spindle speed of 1000 R.P.M. Next a carbide boring bit, mounted in a 1 1/4-inch solid boring bar, is used to rough-bore the two boss holes at a spindle speed of 2000 R.P.M., using a feed of 0.015 inch. The two top surfaces of the bosses are then rough-faced with the same tool as was used for milling the ribs, after which the work is removed from the fixture and allowed to cool in order to avoid distortion.

Fig. 3. After finish-boring two boss holes to a total tolerance of 0.0002 inch, the hole sizes are checked on the jig borer

A second rough-boring operation in the two holes is now performed. For this operation, the boring tool previously used is employed at a spindle speed of 2000 R.P.M., with a feed of 0.003 inch. The finish-boring of these holes is done with a carbide boring bit, held in a 1 1/4-inch micro-setting bar. A feed of 0.015 inch and a spindle speed of 2000 R.P.M. are used. The holes are then checked for size, as illustrated in Fig. 3.

After checking, a 1 1/2-inch sweep tool is used at a spindle speed of 800 R.P.M. for roughing and finishing the 30-degree bevel at the bottom of one boss. The bottom face of the other boss is roughed and finished in the next operation with the same tool and spindle speed. Then, using an "out feed" chuck, a spindle speed of 800 R.P.M., and a feed of 0.0025 inch per revolution, the two top surfaces of the bosses are finish-faced.

The final operation consists of roughing and finishing the shoulder of one of the bosses to between 1.995 and 2 inches in diameter. A 2-inch chuck is used in this operation at a spindle speed

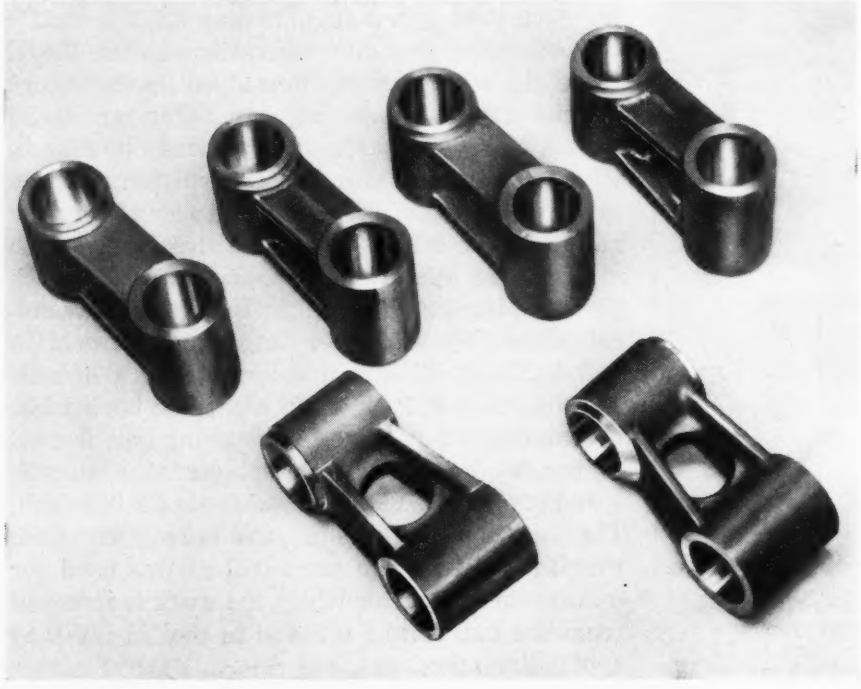


Fig. 4. Examples of parts completely machined in lots of one hundred on a jig boring machine

ot 400 R.P.M. Including 4.5 hours for making the fixture, 6.5 hours for set-up time, and 22 minutes apiece for 100 parts, this production run was accomplished in 47.6 hours. Examples of completed parts are shown in Fig. 4.

Special features of the machine contributed largely to the speed of this precision machining job. For example, all depths were maintained by using various stops provided on the jig borer, and also by means of a scale on the side of the column and a graduated dial on the handwheel for vertical travel. Spindle speeds are set, increased, and decreased by two push-buttons, which control a variable-speed unit. Mounted on a control panel at the right of the column, these buttons are wired to a speed controlling, reversible gear-motor which operates only while pressure is maintained on either the "increase speed" button or the "decrease speed" button. Upon removal of the pressure, the speed setting remains constant at any range desired. Spindle speeds are read directly on an electric tachometer, which shows the speed increasing or decreasing to the desired value as the push-button is operated. Both positive and electrical safety devices automatically keep the speed within the desired range.

Another feature of this jig borer that facilitates high production is the design of the tool-holding end of the spindle, which has a special female taper of approximately 15 degrees. This taper provides the maximum in locating accuracy. A square-cut thread section at the upper end of the taper locks the tools in position. This construction permits rapid tool changing, as well as accurate positioning of tools in the spindle nose.

In machining the aluminum supporting arms, the tools are changed to completely finish each part before the next one is handled. However, it is often desirable to perform certain operations on every piece in a run and set the work up again for subsequent operations. This may be advantageous where there are thin sections between machined surfaces on the parts, so that heat can be dissipated by rough-machining the complete lot before finish-machining. Generally, the design of the part determines the procedure.

Continuous Finish-Shaving of Helical Pinions

Automatic loading in the finish-shaving of helical pinions for Dynaflow transmissions at the Buick Motor Division of the General Motors Corporation makes it possible for one operator to run two machines. The operator merely lays the semi-finished cut gears into a loading chute, which automatically rejects any over-size gears. The finished gears are returned by a chute to the operator for visual inspection; they are held to within 0.0002 inch of the desired lead and within plus or minus 0.0005 inch of the pitch diameter. The complete cycle of the gear-shaving machine is 24.6 seconds, which gives a production of 146 gears an hour per machine.

Automatic loading in a finish-shaving operation enables one operator to run two machines, with an output of 146 gears an hour per machine

* * *

Prizes for Articles on the Use of Cemented Tungsten Carbides

The Society of Carbide Engineers, P.O. Box 141, West Hartford, Conn., has just announced that it will award a prize of $50 to the person who submits the most outstanding article on the use of cemented tungsten carbides. The contest is open to every one except the executive committee of the Society and the contest judges. A certificate will be given, along with the cash prize, to the author of the winning article and all entries will become the property of the Society. Noteworthy articles will subsequently be printed in the monthly paper of the Society. Entries must be in the hands of the Society not later than October 15, 1949.

Good Shop Lighting Improves Quality of Work

The Quality of Parts Made in a Shop is Often Governed to a Large Degree by the Adequacy of the Lighting System. In This Article, the Lighting Requirements for Shop Areas Containing Various Types of Metal-Working Equipment are Discussed

THERE is only one test for the adequacy of a shop lighting system—the ability of employes to see detail on the work and machines readily and comfortably. The principal factors that govern this ability to see are the intensity level or quantity of illumination, the distribution of the light, and the size and brightness of the light source.

Prior to the war, a good start was made toward setting up standards of illumination for different types or manufacturing areas. The accumulation of data was accelerated during the war when industry began to study the effect of illumination on the efficiency of the employes. Briefly, it was found that good lighting resulted in products of better quality, in improved worker morale, in better safety records, and quite frequently in increased production. So far as quality is concerned, it is only reasonable to expect that a worker will turn out a better part if he can see all of it in detail; and it follows that the number of defective parts that are produced will be much lower.

The factor of increased safety with improved lighting is also one that should not be minimized. There is a close correlation between the accident rate in a shop and the level of illumination. Many conditions associated with poor illumination, such as glare, reflections, and shadows, hamper seeing and cause excessive visual fatigue, thus contributing to the industrial accident rate. Then, too, many accidents are caused by delayed eye adaptation when a worker goes from bright surroundings into dark interiors. Accidents that are attributed to carelessness often can actually be traced to difficulty in seeing.

The amount of light required for manufacturing operations varies from a minimum of 20 foot-candles of light on the working plane for rough work to several hundred foot-candles or more for precision machining and assembling operations. In Table 1 are listed the minimum levels of illumination recommended for different types of production areas. It will be noted that these are maintained values; that is, the average intensity obtained over a long period of time. Because of depreciation caused by dirt and use, the values for a new installation should be from 25 to 40 per cent higher, depending on the type of system employed.

Usually both general and local lighting are employed to obtain the necessary illumination. The general lighting system provides evenly distributed illumination over the entire shop area and in sufficient intensity for ordinary seeing tasks, while local lighting is added at individual machines to provide additional illumination for difficult seeing conditions.

Types of General Lighting Systems

Three types of light sources can be employed for general industrial lighting — fluorescent, incandescent, or mercury vapor. For low and medium high bay areas, fluorescent lamps are recommended. They have several advantages over the other light sources mentioned, chief among which are their high efficiency, long life, and low brightness.

Metallic surfaces are partially glossy, so that a small light source of high brightness is reflected from the working surface into the eyes of the workers; also, being small, the light is distributed over only a small portion of the surface, with the result that parts of the work are well lighted, while other portions are quite dark. The large size and low brightness of fluorescent lamps tend to minimize such conditions.

However, with large surfaces, even the fluorescent source may produce relatively small highlights on the work or on the machine. To obtain better distribution of the light on the work, machine tools should be laid out at an angle to the lighting fixtures or else a "grid" lighting system that will give broad highlights in all directions should be installed. Some typical lay-outs utilizing fluorescent fixtures are shown in Fig. 1. Either individually mounted fixtures or continuous rows of lights may be employed, depending on the suitability of the system to the particular shop in question.

The choice between the different sizes and kinds of fluorescent lamps that are available for factory lighting is largely a matter of economics. Hot-cathode lamps (those requiring a pre-heat period to start) of 40 and 100 watts are most widely used. Some cold-cathode installations (lamps started by the application of high voltage across the cathodes) have been made where extremely long life—10,000 hours or more—is desirable. The disadvantages of these light sources is that they are somewhat less efficient than hot-cathode lamps, and there is a probability of greater depreciation between lamp replacements because of their long life.

Instant-starting hot-cathode lamps may be desirable in some instances, and may be specified where their instant starting ability is desirable. In all cases, a careful analysis of the comparative installation and operating costs of the different systems should be made.

Incandescent and mercury-vapor lamps, being with one exception "point light sources," are especially adaptable for general lighting in press rooms, machine shops, and assembly areas where the ratio of plant ceiling height to width of bay is large. Reflector control is more easily accomplished with point sources than with extended light sources, thus enabling the light to be confined to the working plane. Since the fixtures are mounted at a considerable height above the floor level, the light distribution on the working plane is fairly uniform. Aluminum or prismatic glass reflectors are generally used to provide 100 per cent direct light distribution.

Here, too, the choice between the various sizes of lamps and between the incandescent and mercury-vapor sources is usually a matter of economics. Generally, the higher the ceiling, the higher the wattage of lamp required. Mercury-vapor lamps are approximately twice as efficient as the incandescent sources, and have two to four times longer life. However, they are considerably more costly to install, and give a bluish-white light that, while acceptable in some cases, is undesirable in others.

Many industrial installations have been made with mercury and incandescent lamps mounted in alternate reflectors. The incandescent lamps, giving large amounts of light in the red and yellow color range, tend to counteract the deficiency of the mercury-vapor sources in these colors. A system of this type, shown in Fig. 2,

Recommended Levels of Illumination for Metal-Working Areas

Area	Maintained Intensity, Foot-Candles
Welding Shops	
General illumination	20
Supplementary illumination	1000*
Machine Shops	
Rough bench and machine work	20
Buffing, ordinary polishing, medium bench and machine work	30
Fine bench and machine work, fine buffing, polishing, and grinding	100*
Extra fine bench and machine work	200*
Punching, Forming, and Stamping Departments	
Spinning, punching, shearing, stamping, and miscellaneous sheet-metal operations	30
Repair Shops	
Rough bench and machine work	20
Medium fine bench and machine work	30
Fine work—buffing, polishing	100*
Extra fine work	200*
Drafting and Designing Rooms	
Prolonged close work	50
Inspection and Assembly Departments	
Medium work	20
Medium fine work	50
Fine work	100*
Extra fine work	200*
Plating	10
Polishing and Burnishing	20

*Usually obtained by both general and supplementary lighting.

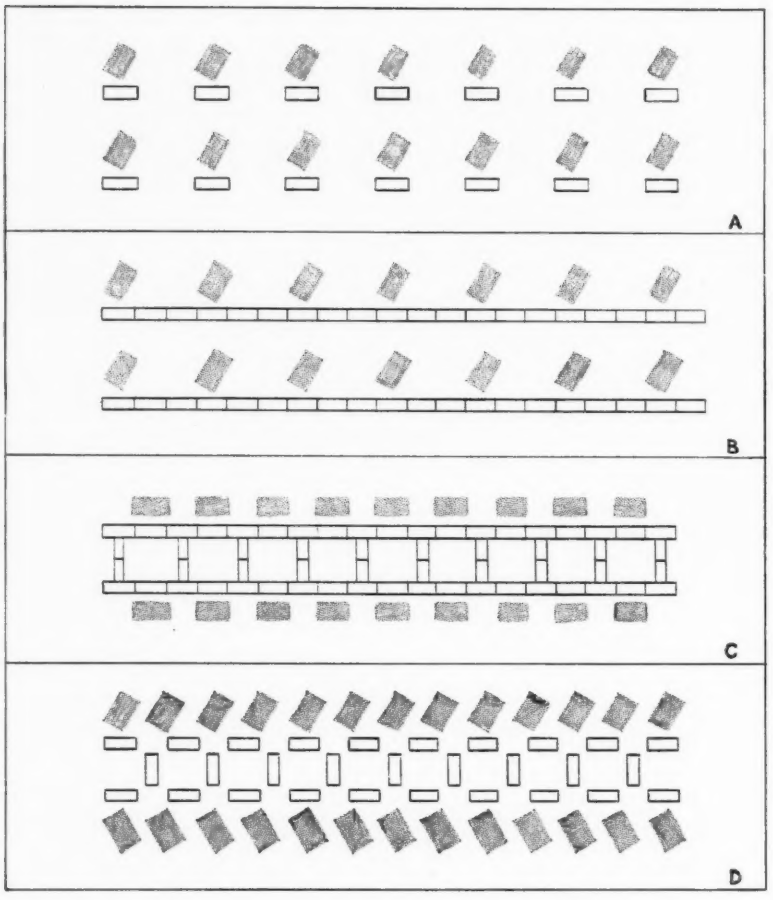


Fig. 1. Typical fluorescent lighting arrangements for general plant illumination. The grid systems shown at (C) and (D), with either continuous rows of lamps or individually mounted fixtures, are specially suitable for metal-working plants

is installed in one of the main manufacturing aisles at the East Pittsburgh plant of the Westinghouse Electric Corporation. A battery of two hundred and thirteen 1000-watt mercury-vapor lamps and one hundred and forty-two 1500-watt incandescent lamps mounted in aluminum reflectors provide an average of 45 foot-candles of light near the floor level.

Good Maintenance of Plant and Fixtures Essential

Whatever the type of lighting system employed, it can be efficiently utilized only if the interiors of the plant are well painted and the lighting fixtures are adequately maintained. Light color surfaces on walls and ceilings are of particular value in providing a high utilization of light because they reflect more light toward the working areas. In addition, some machine builders are painting their equipment with light colors to provide better contrast of the tool against the work and an increased amount of reflected light on those sections of the machines that are in shadow;

Fig. 2. Two hundred and thirteen 1000-watt mercury-vapor lamps and one hundred and forty-two 1500-watt incandescent lamps provide 45 foot-candles of light in this manufacturing aisle at the Westinghouse Works

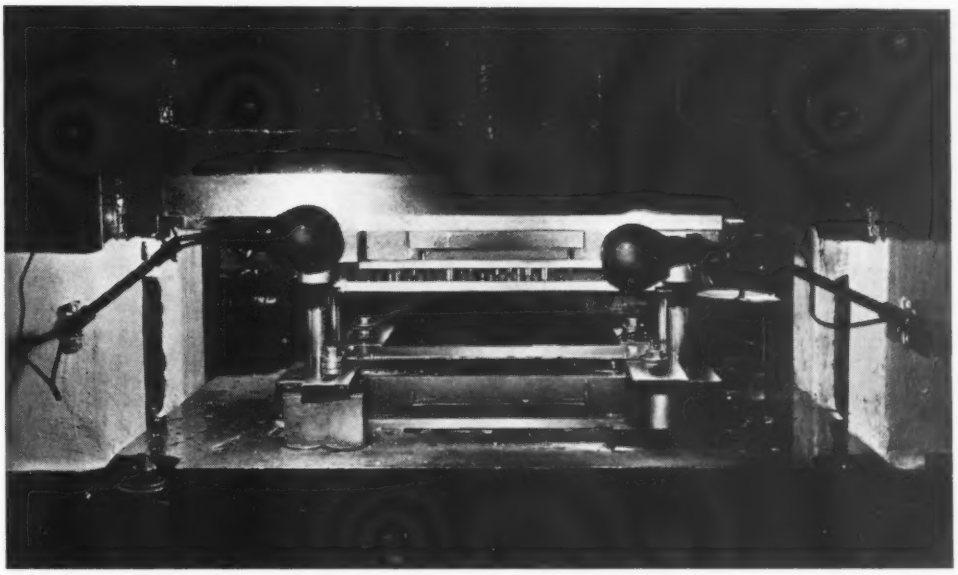


Fig. 3. Two adjustable incandescent lamp fixtures are mounted at the back of this small punch press to provide adequate light on the die. Diffusing glass covers are recommended on installations of this type

some also paint the stationary and the moving parts of machines different colors, so that they can be readily perceived.

Maintenance is important, of course, because only by periodic cleaning and immediate replacement of burned-out lamps can the efficiency of the lighting system be kept at a high level. Various estimates have been made regarding the loss of light due to dirt on lamps and fixtures; the consensus of opinion seems to be that anywhere from 15 to 60 per cent of the light output of an installation may be lost because of inadequate cleaning of the lamps.

Local Lighting on Individual Machines

Because precision machining operations may be performed in areas where a high level of general lighting is unnecessary, and because machines are often so constructed that they cast shadows on the work, it frequently is necessary to install separate lighting fixtures at the machine. In a few cases, these have been made a part of the machine itself. This is called supplementary or local lighting.

Either incandescent or fluorescent types of lamps may be used for supplementary lighting. While fluorescent fixtures are preferable for the same reasons that they are employed in general lighting systems, they are large and may be awkward or unwieldy on many machines. For this reason, incandescent lamps have been more widely applied for local lighting.

If incandescent lamps are used, the reflector should provide a sufficient shield to direct the light on the working surface. The lamp should be adjustable, so that the light can be directed where required. It should also be easy to clean, a glass cover being used if possible. A sufficiently small lamp should be employed to direct the light into crowded areas, and it should have a uniform brightness over an area of at least 5 inches in diameter. The most important of these factors is the use of a reflector to provide proper shielding. If a diffusing glass cover cannot be employed to increase light uniformity, a silver-bowl lamp may be used, because the lamp filament of this type of lighting unit will not be reflected on the surface of the work.

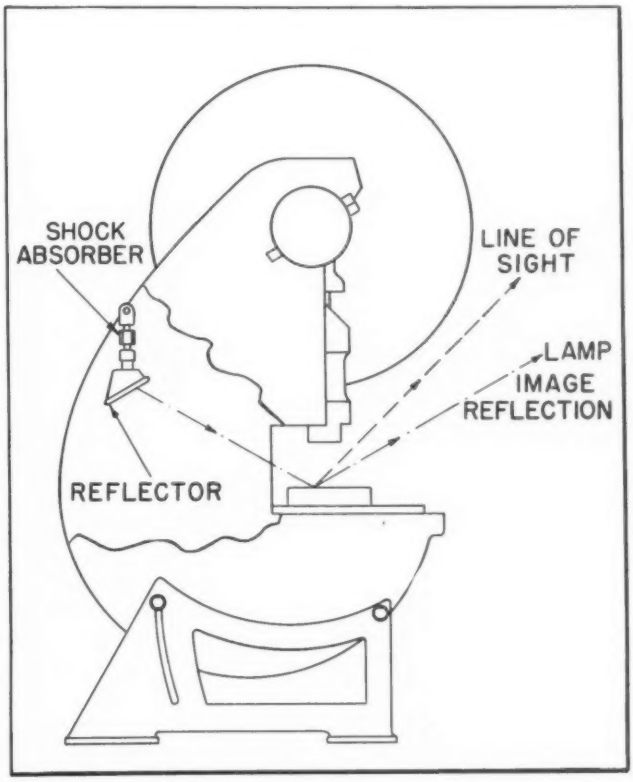


Fig. 4. Method of adjusting local lighting fixture on a press so that reflected light falls below line of sight of the operator

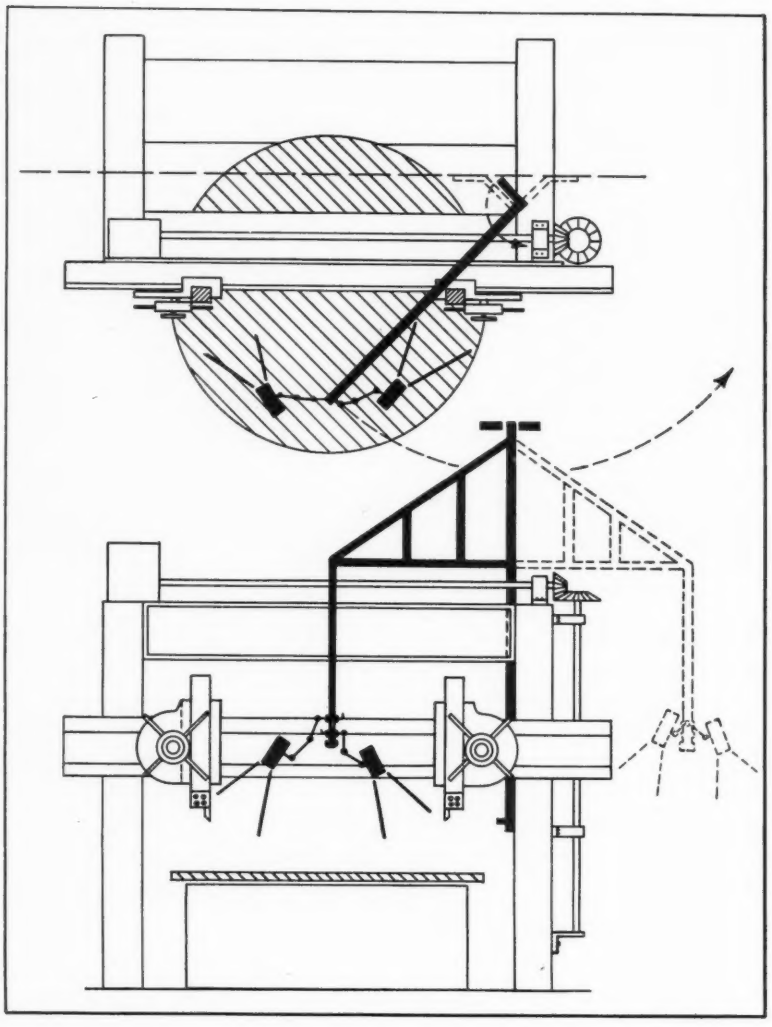


Fig. 5. A swinging boom on which is mounted two 300-watt incandescent reflector lamps is used for supplementary lighting of a large boring mill

In the heading illustration is shown an incandescent fixture for supplementary lighting of a lathe. This ceiling-mounted fixture has a shield over the reflector to minimize glare and permit distribution of the light over a large portion of the machine.

The use of incandescent lamps on a small punch press is illustrated in Fig. 3. Two 50-watt rough service lamps are mounted in adjustable fixtures on the back of the press. The fixtures are so adjusted that the light is directed on the die and is reflected from the die below the line of sight of the operator. The frame of the press is painted white to increase the utilization of light.

A somewhat similar arrangement on another small press is shown diagrammatically in Fig. 4. By reflecting the light on the working surface at an angle and using a diffusing plastic or glass cover, more uniform distribution is obtained; large presses may require a diffusing trough to provide uniformity of light over the die surface; in such cases a fluorescent fixture is ideal.

On larger machines, such as vertical boring mills and planers, a swinging boom carrying 300-watt reflector lamps has proved satisfactory. Such an arrangement is illustrated in Figs. 5 and 6. The boom can be swung over the work, and each fixture adjusted to provide the best light distribution when the cut is being made, or it can be swung away from the machine to permit loading or unloading of the work. Similar installations have been made on other large equipment.

[Credit is due to the Illuminating Engineering Society for cooperation in supplying the material for this article.]

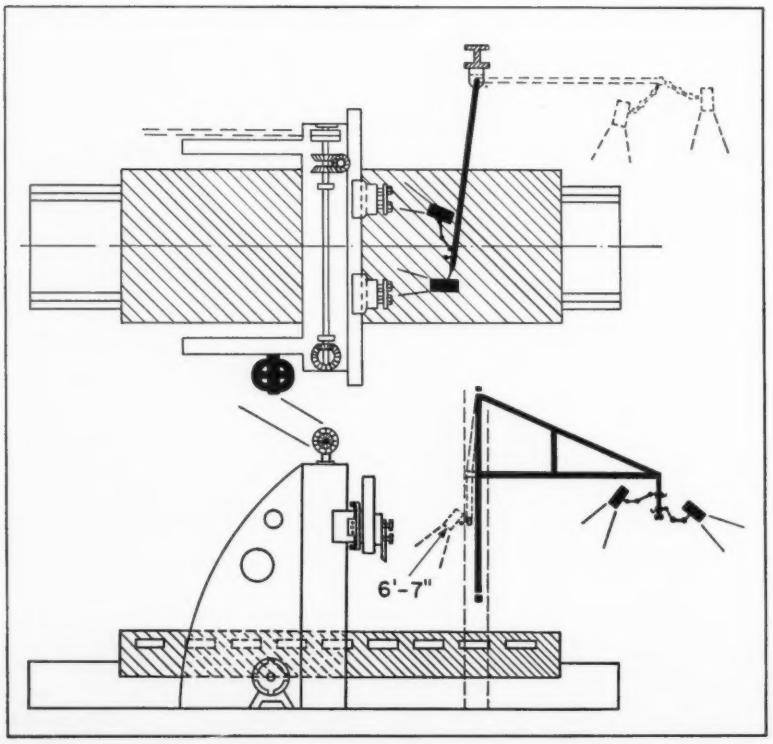


Fig. 6. A similar arrangement to that shown in Fig. 5 is used on a large planer. Fluorescent lights installed at ceiling height and adjusted to distribute the light at an angle on the working plane have also proved satisfactory

Performance Data on Lamps for Industrial Lighting Systems

Lamp		Performance Characteristics of Lamp				
Type	Wattage, Watts	Light Output, Lumens	Efficiency,[1] Lumens per Watt	Average Life, Hours	Color	Remarks
Incandescent	40 60 100 150 200 300 500 1000 1500	485 835 1630 to 1240 2600 3650 5900 10,000 21,500 to 19,100 33,000	11.7 13.9 16.3 to 12.4 17.2 18.3 19.7 20.0 21.5 to 19.1 22.0	1000 1000 750 to 1000 750 750 750 1000 1000 1000	Yellowish-White	Low installation cost. Compact light source. Good for high-bay installations and local machine lighting.
Mercury Vapor[2]	250 400 1000 3000	10,000 16,000 120,000	34.5 35.4 37.2	2000[3] 4000[3] 3000[3]	White (Strong in blues and greens)	Efficient, long life lamp, of compact design. Usually limited to high-bay installations because of brightness.
Hot-Cathode Fluorescent[4]	20 30 40 100	940 1485 2310 4300	32.4 35.0 41.8 32.5	2500[5] 2500[5] 2500[5] 3000[5]	White	Excellent for low and medium high bay installations. Low brightness gives minimum of glare. High efficiency and long life. Generate about 40 per cent less heat than incandescent lamps.
Instant-Starting Fluorescent[4]	26 40 24 39 38 29 51	1400 2300 1410 2100 2350 1920 3250	31.8 33.8 36.2 33.4 38.0 42.7 41.2	2500[5] 2500[5] 2500[5] 2500[5] 2500[5] 2500[5] 2500[5]	White	Same characteristics as hot-cathode lamps, but require high-voltage transformer to start lamps. Industrial use usually limited to places where instant starting characteristics are desirable.

Lamp			Performance Characteristics of Lamp[7]				
Type	Length, Inches	Diameter, Millimeters	Light Output, Lumens	Efficiency, Lumens per Watt	Average Life, Hours	Color	Remarks
Cold-Cathode Fluorescent[6]	52	15 20 25	760 1160 1024	26.3 33.5 34.3	10,000	White	Same advantages as other fluorescent lamps, but have extremely long life. Because of cost, usually limited to areas where instant starting characteristics and long life are important. Require high voltage to start lamp. Life is independent of starts.
	64	15 20 25	950 1450 1280	27.5 35.4 36.2	10,000		
	76	15 20 25	1140 1740 1536	29.2 37.2 38.0	10,000		
	84	15 20 25	1266 1934 1706	29.8 37.9 38.8	10,000		
	93	15 20 25	1408 2151 1898	30.4 38.7 39.6	10,000		
	116	15	1773	31.6	10,000		
	140	15	2153	34.8	10,000		

[1]Lumen efficiency of fluorescent lamps based on 3500-degree white lamps.
[2]Efficiency includes single-lamp transformer loss.
[3]Life based on burning period of five hours per start.
[4]Efficiency includes two-lamp ballast loss.
[5]Life based on burning period of three hours per start.
[6]Efficiency includes 9000-volt high-power factor transformer loss.
[7]Operating Current: 15-millimeter lamps, 0.048 ampere; 20-millimeter lamps, 0.085 ampere; 25-millimeter lamps, 0.090 ampere.
Note: Data for cold-cathode fluorescent lamps supplied by the Fluorescent Lighting Association.

How to Clean Ferrous Metal Parts

By RICK MANSELL

THE successful application of an organic or inorganic coating to iron and steel parts is dependent on the cleanliness of the surfaces, and it is especially important that the parts be free from oil and grease. To obtain adequate adhesion of the coating, it is necessary to remove all traces of the grease or slushing compound applied to the stock at the mills.

Several methods can be employed to remove such compounds, including the use of solvent cleaners, steam cleaning equipment, phosphoric-acid cleaners, vapor degreasing equipment, and alkaline cleaners. Of these, solvent cleaners are probably the most frequently employed.

Use of Solvent Cleaners

Mineral spirits, carbon tetrachloride solvents, and gasoline are the common solvents. They are applied to the metal with a saturated rag, after which the surface is wiped clean with a dry cloth. Rust spots are removed by hand-sanding or by the use of a phosphoric-acid cleaner.

Care must be taken to insure that the solvent and rags are not allowed to become contaminated, thus rendering them useless for cleaning purposes. Also, since mineral spirits and gasoline are highly combustible, adequate precautions should be observed to prevent fire or explosion; carbon tetrachloride and other chlorinated solvents are non-inflammable. With all organic solvents, respiratory aids should be employed to protect the operator.

Steam Cleaning Equipment an Effective Means of Removing Oil or Grease

A number of different types of self-contained, portable steam cleaning units are available commercially, and such equipment provides a very effective method of removing oil and grease. These units include a steam generator, containers for the solutions used in the process, and the necessary hoses and gun accessories.

A balanced spray of the cleaning compounds is produced by adjusting the amount of water and by controlling the temperature and pressure of application. By using the right type of cleaning compound, the heaviest grime and grease can be removed from iron and steel structural surfaces. The chemical compounds used with this equipment are free from soap or resins or from any compounds that might react with the minerals in hard water, and the vapor penetrates the crevices of a structure that might be missed with other cleaning methods. At the same time, the areas covered by the spray gun are wide enough so that the whole of the surface can be cleaned quickly. One commonly used type of steam cleaning gun is seen in operation in Fig. 1.

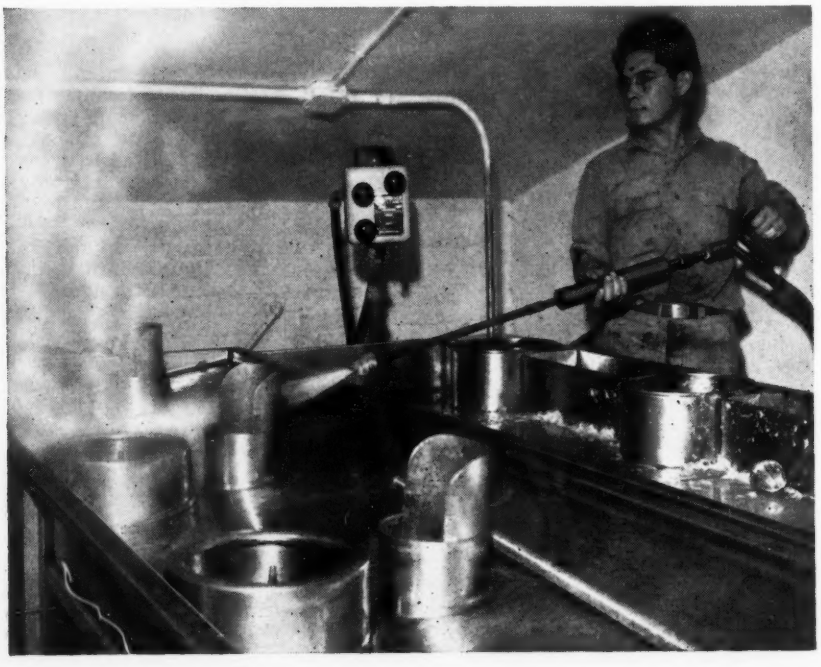


Fig. 1. Self-contained steam cleaning units employing various types of cleaning compounds are effective in removing heavy grime and grease from iron and steel parts

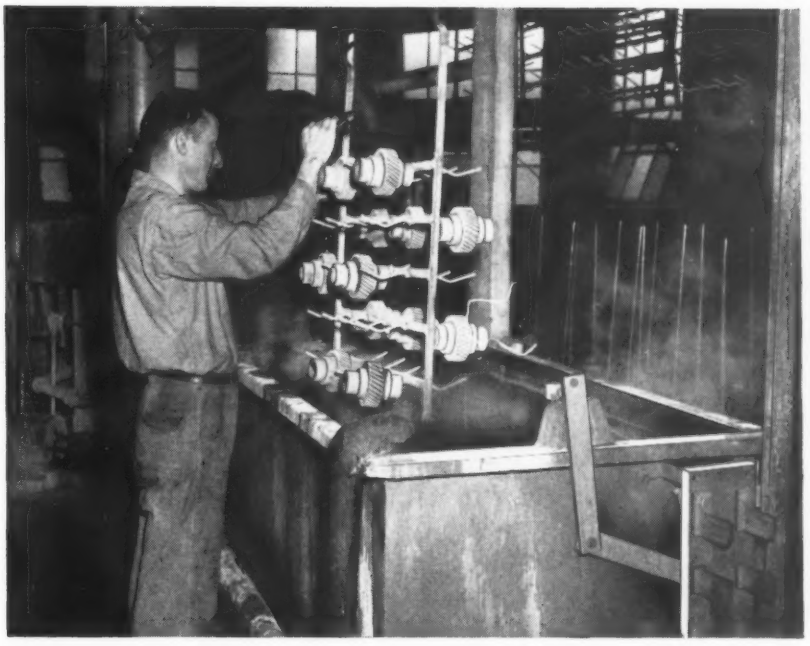


Fig. 2. Small gear and spline assemblies are shown here being mounted on a rack prior to being cleaned by the electrolytic process. The rack acts as the cathode and the tank as the anode

The ordinary steam cleaner is simple to operate, and is fully equipped with pressure and temperature gages. Safety accessories are provided to protect the equipment from damage due to overheating that might result from a sudden failure of the water supply.

Rust May be Removed by Phosphoric-Acid Cleaners

A popular method of preparing steel surfaces for coating is the employment of a phosphoric-acid type of cleaner. Phosphoric-acid cleaners will remove grease, oil, and dirt in a fairly efficient manner if the directions are strictly adhered to; at the same time, they will remove and neutralize any rust that may be present. If the rust is heavy and tightly adherent to the surface, it may be necessary to scrub and sand these areas. Since this type of cleaner is applied with a soft fiber brush, the operator should be protected by rubber gloves and an apron.

The effect of cleaning is readily noticeable—the surface appears much brighter. After applying the phosphoric acid, the surface is rinsed with either hot or cold water—although hot water is preferable—and is then wiped with a rag soaked in alcohol in order to remove all traces of moisture, especially from the seams. Organic coatings should be applied as quickly as possible. If the cleaned surface is allowed to stand longer than half an hour before painting or coating, it should again be wiped with alcohol.

In cleaning heavy steel, it is usually satisfactory to rinse the surface with a mixture of one part of water and one part of alcohol. On smooth plates, the surface need merely be dried.

Vapor Degreasing and Alkaline Cleaning Procedures

Vapor degreasers consist of a boiler that vaporizes the solvent, a degreasing section through which the work is passed, and a solvent recovery coil. The vaporized solvent condenses on the cold parts of the work being cleaned, dissolves the oil and the grease, and washes the solid foreign particles into the boiler. The clean solvents are recovered in a condenser, while the dirt and grease are left behind in the boiler, from which they are periodically removed. The solvents employed are either trichlor-ethylene or perchlor-ethylene; both of these are specially modified to prevent decomposition.

In many cases, provision is made to immerse the work in the liquid solvent before exposure to its vapors. The work is carried on conveyors through the boiling solvent, where most of the grease is removed. It is then passed into a chamber containing the cold purified solvent, and finally, is carried through the vapor chamber. The speed of the conveyor is from six to eight feet per minute. Where conditions are such that a conveyor system is not justified, the work may be dipped by hand, using baskets or racks.

The vapor degreasing process permits a large volume of work to be handled in equipment that requires little floor space. While this process eliminates all the oil and grease, it will not remove any solid particles that are deeply embedded in the surface. Such particles must be removed by an alkaline cleaning process.

The process of alkaline cleaning utilizes a hot tank containing a water solution of an alkaline cleaning compound into which the work is

dipped. To avoid contamination of the cleaning compound, excess oil, grease, and dirt must be removed in a pre-cleaning operation. For this purpose, emulsion pre-cleaners are often employed. These contain chemicals which, in addition to loosening the surface dirt, have the property of increasing the emulsifying and penetrating qualities of the alkaline solvents.

For cleaning iron and steel surfaces, a maximum degree of active alkalinity is employed, and water conditioning is necessary to prevent the deposition of a hard water film on the work. Other wetting agents are sometimes added to insure that the cleaning solution will be worked into intimate contact with the dirty surface, and to enable it to penetrate through the foreign matter.

Alkaline salts, such as sodium phosphate and sodium carbonate, are used to control the pH value of the solution and to emulsify foreign matter. The tank that contains the solution functions as the anode, while the object to be cleaned is suspended from bars, as shown in Fig. 2, that form the cathode.

A sufficiently high voltage is applied so that a current of at least 10 amperes per square foot is obtained at the cathode. This causes a vigorous evolution of gaseous hydrogen that frees the surface of the work from grease by mechanical action. An additional cleaning action results from the formation of free alkali at the cathode —an action that is aided by the mechanical agitation of the solution, which brings fresh portions of the cleaner to the cathode surface.

* * *

Material-Handling Film Brought out by Yale & Towne

A new 16-millimeter sound film entitled "Here's Your Worksaver" has recently been produced for the Yale & Towne Mfg. Co. by the Princeton Film Center to demonstrate how costs are reduced through the use of material-handling methods. As recent studies have shown that approximately 30 per cent of production time goes into material-handling, this film should be of considerable interest to manufacturing executives.

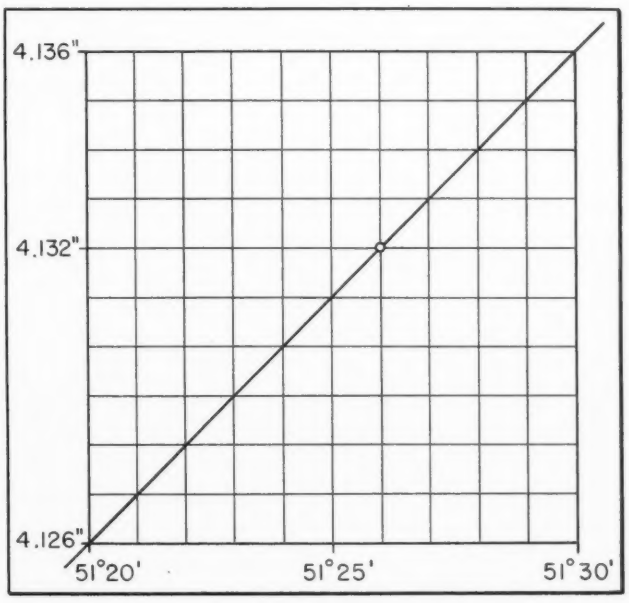
The picture represents a tour through leading industrial plants and warehouses; the danger of hidden costs that creep into material-handling are pointed out, and positive ways of insuring against them are demonstrated. Prints of the film are available, without charge, to manufacturing executives, warehousemen, engineering societies, and student groups from the Princeton Film Center, Princeton 2, N. J.

Rapid Graphical Method of Interpolation

By SHERWOOD C. BLISS

The following graphical method of interpolation has been found to be a great time-saver, compared with the mathematical method described on page 179 of the May issue of MACHINERY. [The latter method was provided by one of the editors.]

In the example mentioned, the helix angle of one of a pair of helical gears is known to be 51 degrees 20 minutes for a center distance of 4.126 inches, and 51 degrees 30 minutes for a center distance of 4.136 inches. It is required to find the helix angle corresponding to a center distance of 4.132 inches.

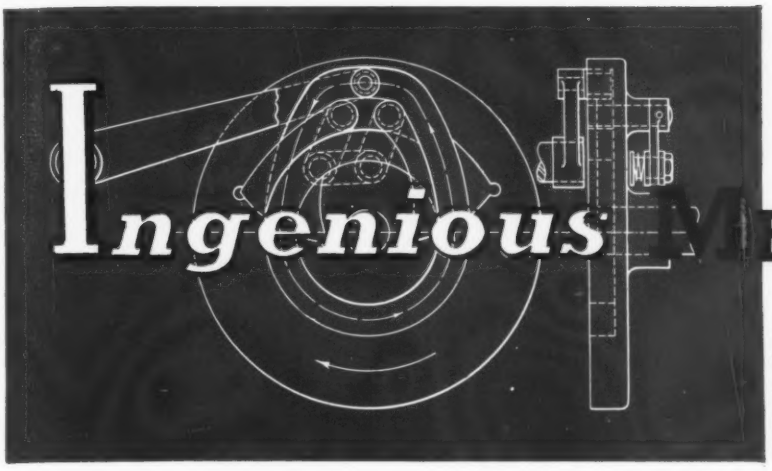


Graphical method of interpolation

Referring to the accompanying diagram, a horizontal scale is laid out so that 1/4 inch equals one minute of angle. On the vertical scale, 1/4 inch equals 0.001 inch of center distance. A line is drawn through the point representing 4.126 inches at 51 degrees 20 minutes and through the point representing 4.136 inches at 51 degrees 30 minutes. The intersection of this line with the horizontal line representing 4.132 inches shows the value of the corresponding angle to be 51 degrees 26 minutes.

* * *

It is estimated that 30 per cent of all payroll costs in 1946 was for material handling, and that 80 per cent of the handling was done without mechanical handling tools.



Ingenious MECHANISMS

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and other Devices

Cone Pulley with High-Ratio Epicyclic Reduction Gearing

By A. W. JANSSON

The cone pulley with epicyclic gearing shown in the cross-section view in Fig. 1 was designed to provide a high-ratio reduction drive for the feed camshafts of several horizontal drilling machines. For this application, the cone pulley *P* was required to make 338 1/3 revolutions for each revolution of the driven shaft *S*. The drilling machines were being used on special automobile work at a time when it was impossible to obtain new or improved machines. The problem of designing the high-ratio reduction-gear drive was complicated by the necessity for keeping the size of the unit within certain dimensions, in

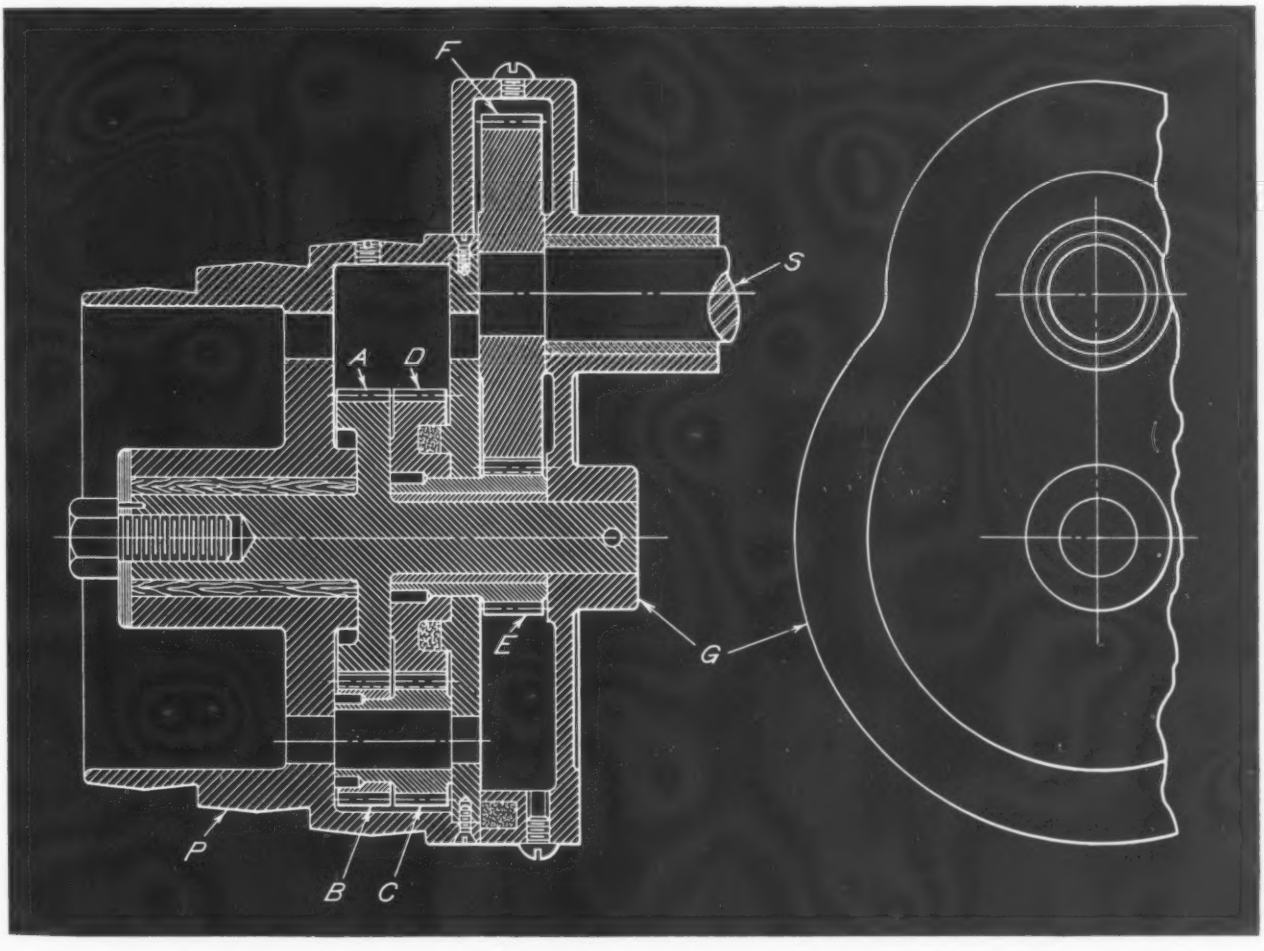


Fig. 1. Cross-section view of cone pulley with high-ratio epicyclic reduction gearing and partial end view of gear housing

order to permit it to be assembled in the space available. The design and construction of the reduction gearing unit was still further complicated by the fact that only a set of 16-pitch milling cutters was available for cutting the gears required.

Under these conditions, it was necessary to deviate from standard practice with respect to center distances between gears and the depth of the gear teeth. The special gears made to meet the unusual requirements, while theoretically incorrect, have given years of useful service. Exact center distances and details of the special gears are not given here, since it is unlikely that readers who may wish to build a similar high-ratio gear-reduction unit will be handicapped by the restrictions under which this unit was designed. With modern facilities for cutting any size and pitch of gear desired, it should be comparatively easy to build a similar gear-reduction unit of almost any desired ratio.

Referring to Fig. 1, the cone pulley *P* is of cast steel, finished all over and accurately balanced. Pulley *P* is fitted with an Arguto wood bearing and is mounted on the hub of the fixed 47-tooth sun gear *A*. The integral hub extending from the opposite side of sun gear *A* is pinned in a fixed position to the stationary housing *G*, which encloses two of the gears and is fastened to the drilling machine frame. The cone pulley

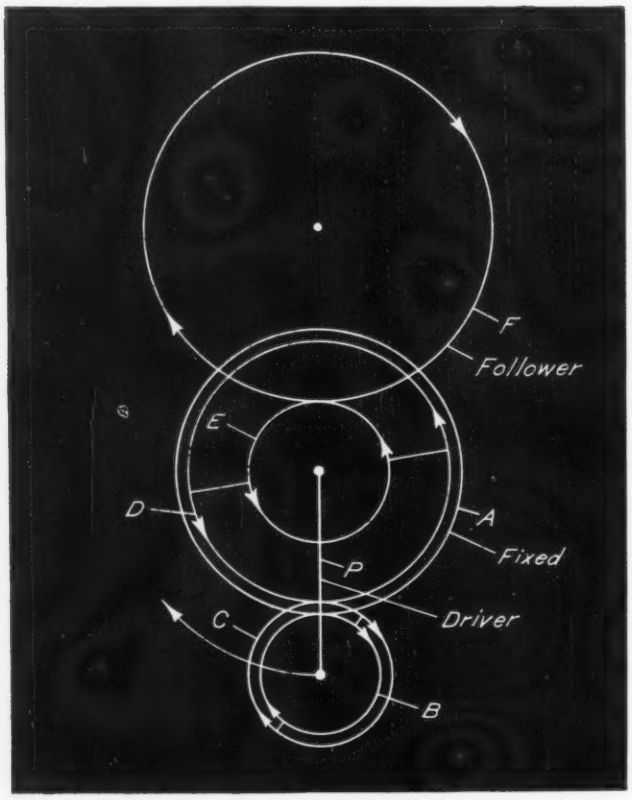


Fig. 2. Diagrammatic lay-out of epicyclic reduction gearing used in mechanism shown in Fig. 1

is retained on the hub of stationary gear *A* by a fiber washer held in place by a dowel-pin and hexagonal head stud as shown.

The follower planet pinion *B*, having 20 teeth which mesh with the teeth of sun gear *A*, is pinned to the hub of the first driving planet pinion *C*, having 21 teeth. Pinions *B* and *C* revolve on a pack-hardened and ground tool-steel pin, one end of which is supported in the heavy web of the cone pulley *P*. The other end of this pin is supported by the steel cover plate secured to the large end of the cone pulley. Although not shown in Fig. 1, a second set of planet pinions, identical to those shown at *B* and *C* and mounted in the same manner, are located in a position diametrically opposite that of the ones shown.

The 49-tooth first-follower, revolving sun gear *D* meshes with planet pinion *C* and is keyed to the 24-tooth second-drive sun pinion *E*. The sun gear *D* and pinion *E* are fitted with a bronze bushing and run on the fixed hub of sun gear *A*. An annular groove in the face of sun gear *D* is fitted with a felt packing ring to retain oil in the chamber which encloses gears *A* and *D* and the two sets of pinions *B* and *C*.

The driving sun pinion *E* meshes with the 58-tooth final driven gear *F* keyed to the camshaft *S*, which runs in a bronze bushing in the stationary housing *G*. The chamber enclosing pinion *E* and gear *F* has a felt packing ring for retaining the gear lubricating oil. This chamber is filled with oil up to the bottom of the bushing in pinion *E*. The chamber which encloses gears *A* and *D* and pinions *B* and *C* is kept about one-third full of oil. The inner surfaces of both oil retaining chambers were coated with insoluble paint.

Three changes of speed are obtainable by shifting the driving belt on the three-step cone pulley. If necessary, the ratio between the speed of the cone pulley *P* and the driven shaft *S* can be reduced by using a smaller size driven gear *F* and a larger size driving pinion *E*. All gears are of machine steel and are pack casehardened. The bores and bearing surfaces of the gears are all accurately ground and fitted. The oil in the gear chambers should be changed frequently when the drives are new, flushing out the chambers with gasoline each time the oil is changed. After the gearing is well run in, oil need be added only as required to maintain the proper level.

It will be noted that in epicyclic gear trains gears that rotate on centers that also rotate are called planet gears or planet pinions, and gears that revolve about a fixed center are called sun gears. A sun gear may also remain in a fixed position, as is the case of sun gear *A* shown in

Fig. 1. The planet pinions are carried by a rotating pulley, such as shown at *P*, Fig. 1, or a rotating arm, as indicated at *P*, Fig. 2.

Fig. 2 is a diagrammatic lay-out of the epicyclic gearing shown in Fig. 1, and is used to facilitate making the mathematical computations required in designing the epicyclic gear train. The same reference letters are used in both illustrations to indicate the same parts. Both illustrations are also made to a scale of one-half actual size, the circles in Fig. 2 indicating the pitch circles of the gears and pinions, and arm *P* representing the pulley *P*.

In the diagram, the arm *P* is shown rotating clockwise and carrying the pinions *B* and *C* with it. Since the teeth of pinion *B* are in mesh with the teeth of the stationary sun gear *A* and planet pinions *B* and *C* are keyed together, the latter two pinions revolve together in a clockwise direction as they rotate or are carried around the fixed sun gear *A* by pulley *P*. As the teeth of pinion *C* are in mesh with those of sun gear *D*, the latter gear will be driven in either a clockwise or counter-clockwise direction, as determined by the epicyclic gearing ratio formula given in the thirteenth edition, fourth printing, of MACHINERY'S HANDBOOK, page 844, Fig. 17. Applying this formula, with the correct reference letter for each of the gears and pinions, we have the ratio

$$R = 1 - \frac{A}{B} \times \frac{C}{D} = \text{ratio of gear reduction or}$$

fraction of a turn imparted to sun gear *D* by one revolution of the pulley or driver arm *P* in which

P = the pulley or driver arm;
R = ratio of gear reduction;
A = fixed sun gear with 47 teeth;
B = planet pinion with 20 teeth;
C = planet pinion with 21 teeth; and
D = driven sun gear with 49 teeth.

Substituting numerical values (number of teeth in each gear) in the formula

$$R = 1 - \frac{A}{B} \times \frac{C}{D}$$

we have

$$R = 1 - \frac{47}{20} \times \frac{21}{49} = 1 - \frac{141}{140} = -\frac{1}{140}$$

Therefore, one revolution of the pulley or driver arm *P* will turn the driven sun gear *D* 1/140 of a revolution. The direction of rotation will be counter-clockwise, or opposite that of the driver *P*, as indicated by the minus or negative sign which precedes the final result. Thus pulley *P* must make 140 revolutions for one complete revolution of sun gear *D*.

Now, since pinion *E*, which has 24 teeth, is keyed to sun gear *D* and drives gear *F*, which has 58 teeth, the number of revolutions of pulley *P* required to obtain one revolution of gear *F*, or the camshaft *S*, is obtained by the equation

$$140 \times \frac{58}{24} = 338\ 1/3$$

The direction of rotation of the camshaft is clockwise, or the same as that of the driving pulley *P*, as will be seen in Fig. 2.

It is interesting to note that a reduction ratio of 10,000 to 1 can be obtained with only the four gears *A*, *B*, *C*, and *D* if they are made with 101, 100, 99, and 100 teeth, respectively.

* * *

How to Do Business under the Marshall Plan

A book entitled "How to Do Business under the Marshall Plan," by E. K. Gubin, is being printed and distributed by Time-Life International of New York City as a public service. The book appeared originally in 1948 and is now in its third edition, the material having been brought up to date with the inclusion of statistical tables showing 1949-50 figures, the text of new E.C.A. regulations, and a chapter on what is ahead during the balance of the Marshall Plan period.

Some of the information contained in the book has been used separately in a visual guide, which shows the step-by-step procedure in securing and completing an order and obtaining payment in U. S. dollars. This wall chart, entitled "The Marshall Plan Sales Planner," is available from the Westinghouse Electric International Co., 40 Wall St., New York 5, N. Y. Copies of the book are limited, but may be requested by writing on a company letter-head to Robert S. Smith, Promotion Manager, Time-Life International, Time & Life Bldg., Rockefeller Center, New York City.

* * *

Text-Books on Hydraulics Available from Ford Trade School

A series of text-books on the subject of hydraulics has been prepared by the Henry Ford Trade School, Dearborn, Mich. The first of the series includes information about pumps and valves—their maintenance and repair—as well as data on the practical application of hydraulics to machines for the control of speeds and feeds. These lesson sheets were prepared especially for the instruction of Ford trade students, but they are furnished to the public upon request.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

"Liquid Stainless Steel" is Applied Like Paint

With a product called "Liquid Stainless Steel," developed by the Plastics Division of the Lockrey Co., College Point, N. Y., it is now possible to apply a coating of stainless steel to any surface by brushing or spraying, in much the same manner as a coat of paint would be applied. In making this liquid coating, stainless steel is broken down into flakes of microscopic size and incorporated in a liquid plastic with a solvent to bring it to brushing consistency.

"Liquid Stainless Steel" has good adhesion to both wood and metal, as well as to other finishes, and is quick drying. It is supplied in either the natural steel color or iridescent metallic shades of gold, maroon, jade, or blue. 201

Aluminum-Soda Base Grease for Heavy Duty

An aluminum-soda base grease with an exceptionally high melting point has been brought out by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia, Pa., for heavy-duty industrial or automotive applications. The new grease, designated "Sta-Put 18H-2," is especially recommended for large heavily loaded presses—particularly older equipment where bearings are worn; contracting, mining, and dredging equipment; hoists, cranes, and similar industrial applications, except electric motors or ball or roller bearings, where a soda-soap grease is recommended. Tests have shown that "Sta-Put 18H-2" will not separate in automatic or centralized lubrication systems. 202

Aluminum Powder Makes New Type Cold Solder

The new type automobile body solders made from powdered aluminum appear destined to replace the older type solders which had to be melted and flowed into dents and other damaged areas of the body. The new solders require no heat, and thus avoid damaging adjacent painted surfaces. Several successive applications can be employed to build up thicknesses up to 1 inch.

These cold solders are doughlike—about the consistency of plastic wood. When applied with a spatula or wiper, the solvent evaporates and the metal mass soon hardens sufficiently to be filed or sanded. They adhere strongly to a properly cleaned surface. When sanded smooth, they provide an excellent base for paint, enamel, or lacquer coatings. A wide variety of applications for these solders is now being studied by the Reynolds Metals Co., 2500 S. Third St., Louisville, Ky., who aided in developing them....203

Bearing Bronze Cast Continuously to SAE 660 Specification

"Asarcon 773" is the trade name of the new continuous-cast method of producing bearing bronze having 83 per cent copper, 7 per cent lead, 7 per cent tin, and 3 per cent zinc to meet SAE 660 specification. This material is being made under a patented process by the American Smelting & Refining Co. for Ampco Metal, Inc., Milwaukee 4, Wis. The continuous-cast method insures a dense, solid metal that is free of porosity, dross, or sand inclusions and that provides superior performance, with longer life. 204

Emulsion Cleaner for Industrial Washing Machines

A ready to use emulsion cleaner known as "Mul," which combines solvent and emulsion cleaning with the action of soil-penetrating agents, is being manufactured by the DuBois Co., Cincinnati 3, Ohio. This cleaner strongly resists hard water attack and minimizes curd formation. It is inhibited against foaming even in high-pressure washers. When used for washing, as an additive to rinse tanks, or as a dip, it provides rust inhibiting action during production and short-time storage periods. It is also suitable for pre-wetting metal products before alkaline cleaning or vapor degreasing. 205

Dual-Purpose Oil for Hydraulic Systems and Way Lubrication

For use in hydraulically operated machine tools in which way lubricant is fed by pressure from the hydraulic system, a new dual-purpose oil has been developed by the Sun Oil Co., Philadelphia 3, Pa. This new lubricant, named "Lubeway," has already been subjected to more than a year's exhaustive testing in machine tool builders' laboratories and under regular production conditions in industry. It was found to have all the stability and non-sludging characteristics of a good hydraulic oil, and also to possess the metal-wetting and extreme-pressure qualities of a good way lubricant. This oil is available in two viscosities—150 and 300. 206

Cleaners Developed for Aluminum, Magnesium, and Other Metals

A new group of cleaners applicable to various metals is now being placed on the market by the Hanson-Van Winkle-Munning Co., Matawan, N. J. Matawan 20-W is a mild non-etching cleaner for the soak cleaning of aluminum. It is also applicable, as a soak or cathodic cleaner, to zinc-base die-castings and brass parts.

Matawan 25 is a non-silicated medium caustic base cleaner especially designed for etching aluminum for appearance or in preparation for spot-welding or anodic paint coatings. Matawan 30 is a silicated medium caustic base cleaner containing no foaming or wetting agent. It is designed principally for spray type washing of steel parts and tends to keep machine and jets free of lime scale.

Matawan 30-W is a silicated medium caustic base cleaner containing a suitable wetting agent. It can be used on iron, steel, brass, or bronze as a soak or as an electrocleaner. Matawan 50-W is a non-silicated high caustic content type cleaner used as a soak solution for cleaning magnesium. 207

Uniform Tungsten Powders for Carbide Tools

Commercial production of fine tungsten powders, with precise and predictable particle size and distribution for the critical requirements of tungsten-carbide tool manufacturers, has been achieved by the Tungsten and Chemical Division of Sylvania Electric Products, Inc., Towanda, Pa.

The problem of control of these two physical properties has heretofore been possible only by expensive, time consuming research laboratory control, impracticable for commercial production. Over 75 per cent of the individual particles measure below 5 microns, or approximately 0.00004 inch in diameter. The new control method makes it possible to supply material to meet toolmakers' exact specifications without varying their processing. 208

Tenite II Available in Clear Transparent Form

Crystal Tenite II, a new form of Tenite II, has been announced by the Tennessee Eastman Corporation, Kingsport, Tenn. This new form is expected to broaden the applications of that plastic to include products which require transparency approaching optical clarity. 209

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on these pages, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning name of material as described in June, 1949, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on the blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME.....**POSITION OR TITLE**.....
[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM.....

BUSINESS ADDRESS.....

CITY.....**STATE**.....

Turning Steel-Mill Rolls at High Speed

THE turning of chilled cast-iron and steel rolls for steel mills at speeds as high as 110 surface feet per minute has been made possible through the development of a tracer-controlled engine lathe designed specifically for this class of work by the Monarch Machine Tool Co., Sidney, Ohio. The use of carbide tools and Monarch-Keller electrical contouring controls on this machine is said to enable the present turning time to be reduced by two-thirds or more, even on the toughest chilled-iron rolls.

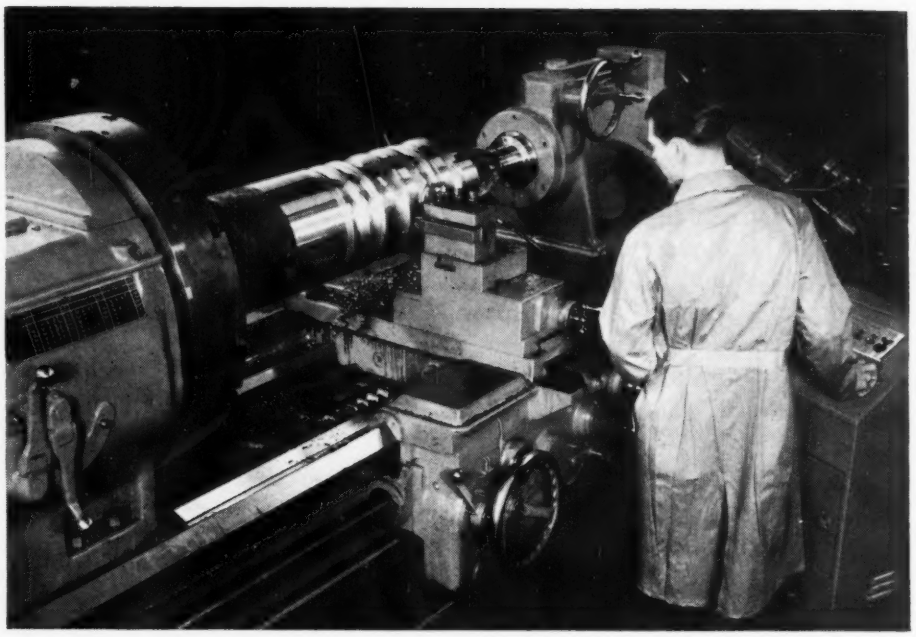


Fig. 1. Cuts at speeds as high as 110 surface feet per minute are taken on chilled cast-iron and steel rolls for rolling mills on a new Monarch lathe equipped with a tracer unit that operates both the carriage and the tool-slide through magnetic clutches

In the conventional practice followed in steel-mill machine shops, high-speed steel form tools are used, with the work turning at a low surface speed. The tools are supported on rests and driven into the work by means of wedges and heavy hammers. The operator checks dimensions from a templet. Thousands of form tools often have to be kept on hand to suit the various grooves that it is necessary to turn in different types of rolls.

With the new lathe, a cylindrical type of carbide tool can be used to produce thousands of different shapes in rolls, and the necessity of having a large quantity of form tools on hand is eliminated. The same carbide tool can be used for different operations as long as the radius on the tool is smaller than the radius or radii required on the roll surfaces. This is because the roll contour is controlled by the tracer unit, and the latter operates both the carriage and tool-slide feeds through magnetic clutches. Probably six to eight carbide turning tools will

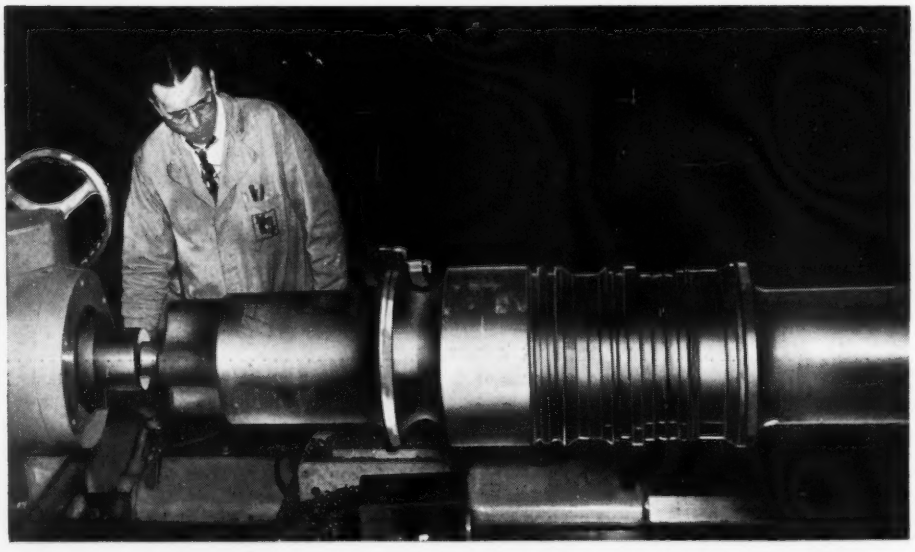


Fig. 2. Another view of a typical contour turning operation being performed on a steel-mill roll; this photograph was taken from the back of the roll-turning lathe

be sufficient for all the shapes required in any one roll shop. According to Monarch engineers, the insert type of carbide tool, with a cylindrical carbide tip mounted vertically, has proved most satisfactory.

While a tool guiding templet is required for every roll, the templet can be used over and over again as the rolls need to be recut or new rolls are provided, and the operator has the assurance that the templet previously used will duplicate exactly the specified contour. There is no danger that the operator will inadvertently modify the contour, and there is no need to send all rolls of a mill stand to the machine shop when a broken roll must be replaced.

Fig. 1 shows a typical roll-turning operation from the operator's side of the machine, while Fig. 2 is a view of the machine taken from the rear of the lathe. This particular machine has a 32-inch swing; it is the intention of the company to bring out soon a 60-inch lathe which will be designed to handle the largest rolls used in the steel industry. Two drives are provided for the headstock, sixteen fast speeds being available to suit the use of single-point carbide tools, and eight slower faceplate speeds for turning some shapes with form tools. Spindle speeds range from 2 1/2 to 505 R.P.M. The headstock is without a gear-box or end gearing, since all speeds are electrically controlled.

Both the headstock and tailstock centers are of the rotating type, so that there is no wear of the centers in the rolls. As seen in Fig. 3, the headstock is equipped with jaws to suit either a three- or a four-spline wobbler. On rolls up to 24 inches in diameter, it is generally necessary to support the roll on centers because of the high speeds used with the contour control method of machining and because the tool is accurately controlled from a templet, the alignment of which is always true with reference to the center line of the machine. The neck supports used on conventional roll lathes are not required because the tool pressures are low with the new method. Since the rolls are turned on centers, the necks can be turned with the same setting.

Both longitudinal and transverse tracer-controlled tool motions are screw-actuated to obtain positive feeds. As a result, the high tool pressures ordinarily involved can have no effect upon the accuracy of the contour being machined. The rapid-traverse mechanism is located at the tailstock end of the lathe, a close-up view of this unit being shown in Fig. 4.

This new roll-turning lathe was recently demonstrated to a group of technical press editors who were also shown other Monarch machines being operated under typical shop conditions. In one outstanding demonstration, S A E 1050 steel was turned at a speed of 1650 surface feet per minute. The depth of cut was 5/16 inch and the feed 0.015 inch; 140 cubic inches of metal were removed per minute. This lathe was driven by a 50-H.P. motor.

Other operations demonstrated were the turning of a Studebaker steering knuckle on a Mona-Matic; the turning of a motor shaft on a Mona-Matic; the turning of gear-box shafts on an air-tracing Uni-Mat; the turning of pump shafts on a 20-inch Series 60 lathe equipped with an Air Tracer; and the turning of headstock shafts on a 20-inch heavy-duty Model M lathe.

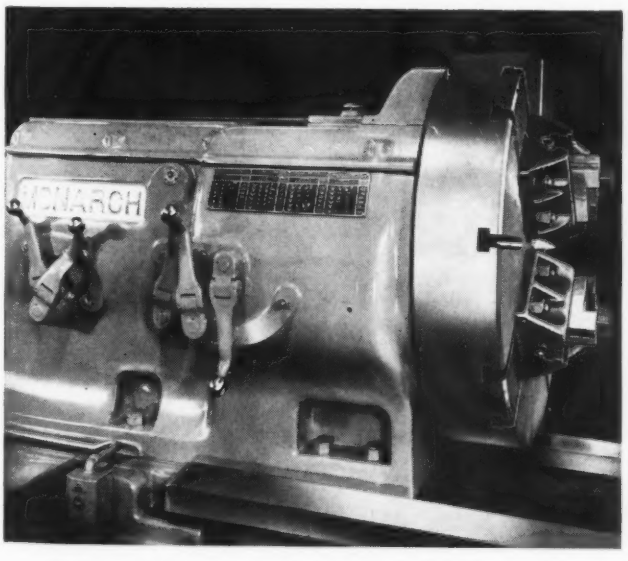


Fig. 3. The headstock faceplate is equipped with jaws for driving steel-mill rolls on the wobbler section, the rolls being accurately supported on live centers of the headstock and tailstock

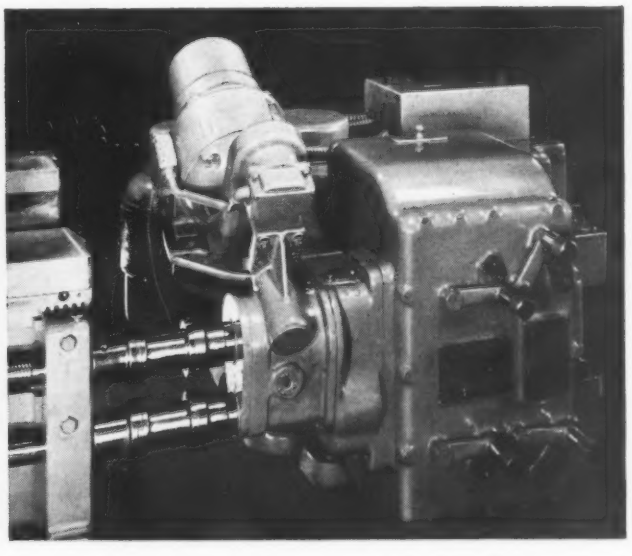


Fig. 4. The rapid-traverse mechanism enables the operator to inch the cutting tool into position or to move it quickly from one end of a roll to the other through the operation of push-buttons

"Investments in the Future," the

RATES of allowable depreciation on production equipment, the accounting practice of machine tool companies, prospects for business with European nations, and other topics of vital interest to machine tool builders were the subjects of papers presented at the forty-seventh spring meeting of the National Machine Tool Builders' Association, held at the Edgewater Beach Hotel in Chicago May 11 to 13, inclusive.

In his paper "Are We Giving Away Invested Capital?", Jerome A. Raterman, president of the Monarch Machine Tool Co., pointed out that that is exactly what a great many companies are doing today. He said that this was due to the fact that accounting procedures do not properly interpret what is happening to the capital companies have invested in productive equipment.

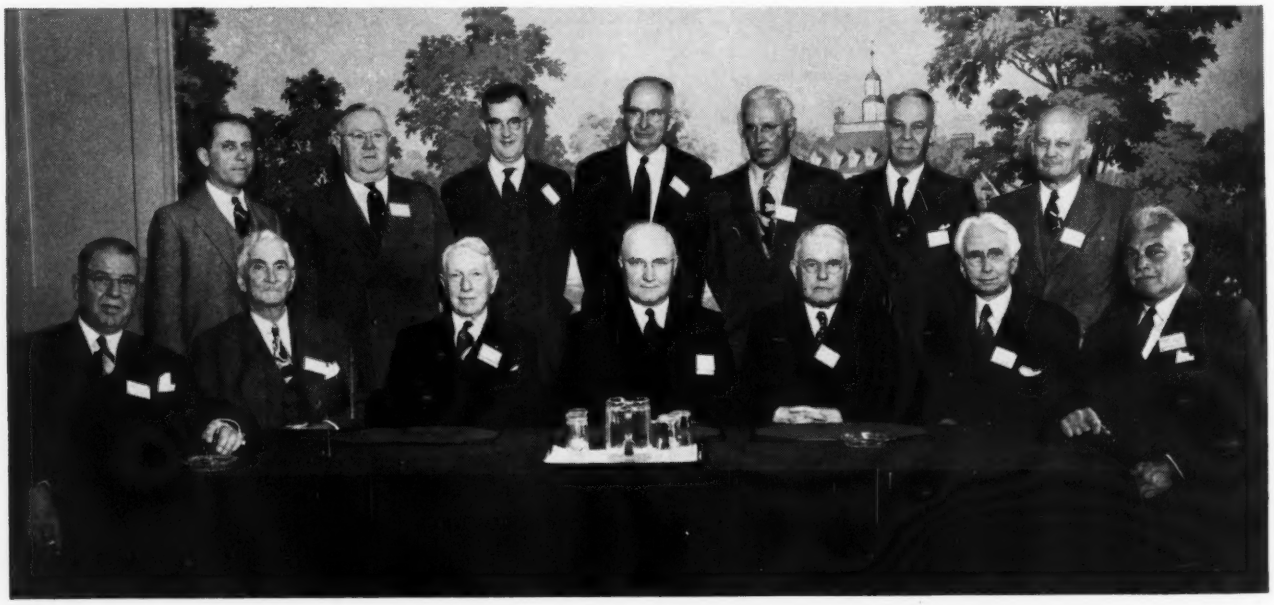
To illustrate, he said: "Let's take an imaginary company and use round figures. Suppose you pick up the statement of the ABC Co. and you see in the balance sheet that Property, Plant, and Equipment stands at $1,000,000. On the Income Account, you note that, in the current year, the company has taken a depreciation of $100,000. Now, let's assume that "Plant and Equipment" was bought ten years ago at a cost of $2,000,000. It has been depreciated at the rate of 5 per cent a year. That's why it now stands on the books at $1,000,000. Depreciation is still being taken at 5 per cent a year.

"All of you know that, with costs as they stand today, to replace that equipment would cost not $2,000,000 but $4,000,000. That company is therefore taking a depreciation allowance of just one-half what would be required for replacement purposes."

Mr. Raterman then asked what happens in case a company distributes practically all of its net profits and relies entirely upon its depreciation allowance for replacement purposes. The answer was that unless the company borrows from banks or puts out a stock issue, it will be able to replace only half its present equipment. In other words, the plant will get smaller and smaller and will finally have only one-half the capital assets in plant and equipment that it had in the beginning. He pointed out that any company that is going blindly along on a 5 per cent depreciation schedule and is setting up no reserves for depreciation deficiency is literally overstating its net profit. Mr. Raterman called for changes in accounting methods to take care of present conditions.

Investment for Survival

In his paper "Investment for Survival," Lloyd D. McDonald, president of the Association and vice-president of the Warner & Swasey Co., referred to the historical concept that cycles in



Past presidents of the National Machine Tool Builders' Association at the forty-seventh spring meeting of the Association. Seated, left to right, Charles J. Stilwell, R. K. LeBlond (dean of machine tool builders), Edward A. Muller, Lloyd D. McDonald (present president), James E. Gleason, J. B. Doan, and Norman D. MacLeod. Standing, left to right, Frederick V. Geier, Howard W. Dunbar, John S. Chafee, William P. Kirk, G. H. Johnson, Herbert H. Pease, and Alexander G. Bryant

Theme of Machine Tool Builders

civilization are inevitable, and that any civilization must sooner or later fall. He called attention to a philosopher's recent contention that civilizations fail only when they are unable to adapt themselves to an entirely new set of circumstances.

According to Mr. McDonald, this theory presents a twofold challenge. First, we must make our own political and economic system work so well that not only our own people, but people in other countries, will prefer it to the model offered by our competitor. Second, we must keep this country so well prepared from the standpoint of national defense that we will be ready for adequate action immediately in the event of war. His paper then explained in detail how machine tools have a bearing upon both of these objectives —how they can increase standards of living by providing better products at lower prices; and how the machine tool industry could re-equip metal-working plants to fully prepare for national emergencies if certain government restrictions were removed.

Machine Tools are Still the World's Best Investment

The fact that, while machine tools are the world's best investment, many concerns are not using all of the "ingenuity, imagination, and ability we have within our industry in selling our products" was discussed in a paper prepared by James C. Hebert, chairman of the Committee on Sales and Service and general sales manager of the Jones & Lamson Machine Co. In Mr. Hebert's absence, this paper was presented by Daniel R. Weedon, assistant manager and secretary of the Blanchard Machine Co.

The paper suggested that every company should challenge its own sales approach and make every effort to improve its sales technique. Definite suggestions were made as follows: (1) More thorough training of factory and distributor representatives; (2) tabulation and presentation of more complete instructions and information regarding the cutting of metal; (3) more complete and detailed literature; (4) a thorough analysis of the market for products, and the preparation of technical data for the field men, showing illustrations of a wide variety of applications; and (5) provision to field men of every bit of help and advice that can be given them on matters relating to merchandising and sales technique.

Attention was called to the fact that sales conferences scheduled for this year will be held at various universities as follows: Cornell University, July 11 to 16; Western Reserve University, July 25 to 30; Dartmouth College, August 8 to 13; and Purdue University, August 15 to 20. Already there is an enrollment of 300 men for these courses.

Investment in Europe

Tell Berna, general manager of the Association, presented a paper in which he mentioned that the tentative allocation of funds by E.C.A. available for the fiscal year of 1949-50 for machine tools built in the United States alone are as follows: France, $17,200,000; Italy, $15,000,000; United Kingdom, $14,022,000; Sweden, $5,000,000; Switzerland, $5,000,000; Belgium, $3,700,000; Bi-zone Germany, $3,400,000; Netherlands, $5,000,000; Austria, $2,816,000; Denmark, $3,000,000; and Norway, $2,000,000. Other nations that will participate in very much smaller sums, as they are not large users of machine tools, are Greece, Iceland, Ireland, Portugal, Turkey, and Trieste.

Mr. Berna then discussed in detail the procedure that must be followed by a company doing business with foreign countries under the E.C.A.

Investment in Youth

"Investment in Youth" was the title of a paper by J. Edward Goss, chairman of the Committee on Apprentice Training Standards, and industrial activities administrator of the Brown & Sharpe Mfg. Co. This paper pointed out that sound management of corporate interests is concerned not only with the present, but with the years far ahead, in which it can take no active part. During the last two decades, industry has placed considerable emphasis on the selection and training of engineering college graduates, and this particular investment in youth, if carefully made, should help to perpetuate certain higher level functions, especially those requiring engineering skills. Also, it should be a source from which management prospects may be obtained.

Mr. Goss said that it should be borne in mind, however, that many youths with mechanical aptitude and potential skill do not go beyond the high school and that the training of such young men in certain work processes has its rightful place in the industry. The speaker then called attention

to the book "Apprentice Training Standards" that has just been compiled by the committee of which he is chairman, and mentioned that this book constitutes a recommended guide for starting and successfully carrying on a program that will assure a supply of men of adequate skill and capable leadership for an indefinite time.

Investment in Community Relations

Public relations in the machine tool industry, according to L. W. Scott Alter, chairman of the Committee on Public Relations and president and general manager of the American Tool Works Co., should consist, first, of trying to educate customers and prospects as to why they should buy more machine tools, and second, of educating the people in machine tool plants, in plants using machine tools, and in Government, as well as the public at large, concerning the function of machine tools in a free economy. Mr. Alter stated that it is for this purpose that the Association published the booklet "Machine Tools Today," of which over 50,000 have been distributed since the book was issued six months ago.

The point was stressed that it is not enough that the purchaser be "sold" on new and better machines; the operators in metal-working plants likewise must be sold upon increased output, as well as government officials, educators, and the general public. Mr. Alter outlined a public relations program that each machine tool builder could follow in his own community, such as holding an open house for the people of the community; inviting the clergy and educators of the community to visit the plant; developing a speaker's bureau available to organizations and radio stations, which would supply talent capable of discussing the basic principles of the free enterprise system; fostering the use of motion pictures designed to teach the fundamentals of our economic system; establishing better working relationships with newspapers and radio commentators; embarking on educational advertising programs; and taking a more active part in civic affairs.

No Evidence of Actual Depression in the Offing

The speaker at the formal dinner was W. W. Townsend, nationally known economist and partner of Townsend-Skinner & Co. of New York City. Mr. Townsend stated that there is no evidence yet that an actual depression is in the offing. He said that today there is no excessive optimism; there are no undermargined positions in the security markets; no speculation in commodities; and no unwarranted inventory expansion. Consequently, any depression that may overtake us will be largely emotional and probably of very short duration. He pointed out the importance of recognizing the difference between a recession and a depression; a recession, he said, is a return from an abnormally high level of activity to a normal level and is healthy, whereas a depression is a retreat from a normal level of activity to a sub-normal level and is unhealthy.

The speaker stated that with volume reasonably well assured, with material costs decreasing, with the threat of a fourth round of wage increases practically lifted from our shoulders, and with the productivity of the worker himself increasing as the result of the publicity given to sporadic lay-offs in the country, the profits of industry may be somewhat less than they were in 1948, but there is no present reason to anticipate their disappearance.

A. G. Bryant, chairman of the Government Relations Committee and vice-president of the Cleereman Machine Tool Co. and president of the Bryant Machinery & Engineering Co., presented a detailed analysis of the Washington scene as it concerns the machine tool industry.

* * *

Meeting of Machine Tool Group Advisory to National Security Resources Board

Guest speakers who were members of the Tools Division of the War Production Board were a feature of a recent meeting of the Machine Tool Group Advisory to the National Security Resources Board. These speakers were George Johnson, John S. Chafee, Bert Stedfast, and Charles Simmons. Other speakers included Captain E. R. Henning, General S. Reimel, and H. L. Tigges, chief of the Machine Tool Section, Manufacturing Production Group. A paper dealing with mobilization planning of the machine tool industry was presented, and there were reports on various activities of the Group by members.

* * *

Automobiles account for over 600,000,000,000 passenger-miles of United States travel yearly, compared to about 25,000,000,000 each for day coaches and inter-city buses, 12,000,000,000 for pullman trains, and 6,000,000,000 for airplanes. Truck driving provides 3 1/2 times as much employment as all United States railroads.

Tool Engineering Ideas

Tools and Fixtures of Unusual Design, and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

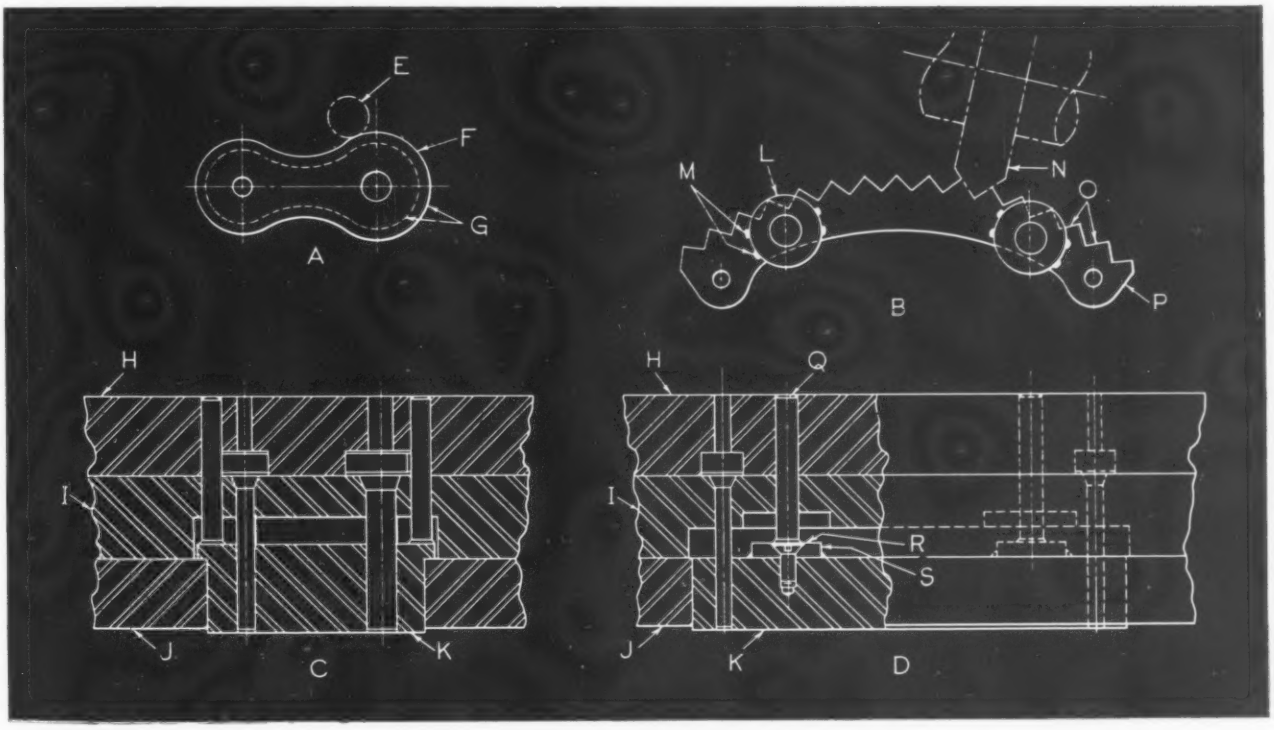
Simple Method of Making Die Shedders or Strippers

By CLIFF BOSSMANN
Tool Design Department
National Cash Register Co., Dayton, Ohio

The time required for making compound blanking and piercing dies and the cost of such tools are often considerably increased by the necessity for providing accurately fitted shedders or strippers for ejecting the blanks. This is especially true of a great majority of the dies used in producing parts for cash registers, which have radial surfaces or profiles, such as shown by the dotted line at *G* in view *A* of the accompanying illustration.

View *A* is actually a plan view of the shedder *K* of the die shown in the cross-section view *C*. This die pierces and blanks out a link of the form shown by the dotted line at *G*. The shedder for such parts must, in most cases, have the same shape or profile as the blanked and pierced part. The usual and most practical method of machining a shedder of this kind is to mill the working section to the shape indicated by the dotted line at *G* with an end-mill *E*, as well as the integral outer flange indicated by the full line at *G*.

When the part to be blanked and pierced has a profile such as that of the shedder *P* shown in view *B*, a saving in time and machining costs can be realized by making the working part without a retaining flange. The working portion of the shedder *P* can then be milled to shape by using a milling cutter, as indicated at *N*, without considering the retaining flange. It is then simpler and costs much less to employ round countersunk washers *L*, secured by flat-head screws to the main shedder *P*, to take the place of an integrally machined retaining flange. The



(A) Plan view of shedder (K) shown in cross-section of die illustrated in view (C). (B) View of three-part shedder shown assembled in die at (K) in view (D). (C) Blanking and piercing die for producing link of shape shown by dotted line at (G) in view (A). (D) Die for producing toothed quadrant of shape indicated at (P) in view (B)

washers L are tack-welded as indicated at M, and over the screw-head is added a layer of hard tool weld metal.

This type of shedder, when installed in a die as indicated at K in view D, is left soft so that the profile-milled surfaces will not be warped by heat-treatment, chromium-plating being substituted for the hardening operation. It will be seen that the shedder ejector-pins Q rest on the hardened tool weld metal R, applied over the head of the screw in the retaining washer indicated at S. The die members H and J are of conventional design and construction.

In the case of the one-piece shedder K shown

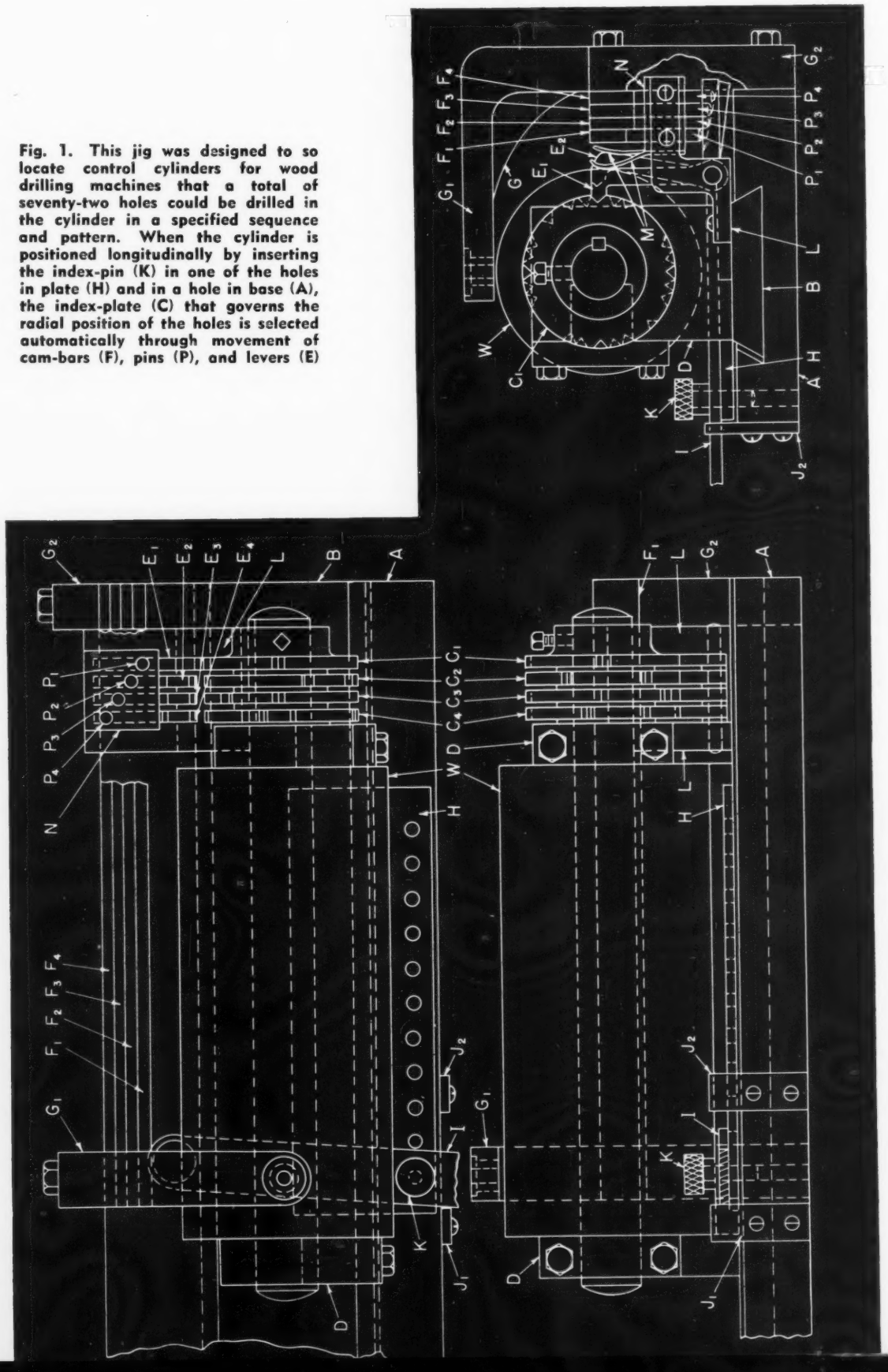


Fig. 1. This jig was designed to so locate control cylinders for wood drilling machines that a total of seventy-two holes could be drilled in the cylinder in a specified sequence and pattern. When the cylinder is positioned longitudinally by inserting the index-pin (K) in one of the holes in plate (H) and in a hole in base (A), the index-plate (C) that governs the radial position of the holes is selected automatically through movement of cam-bars (F), pins (P), and levers (E)

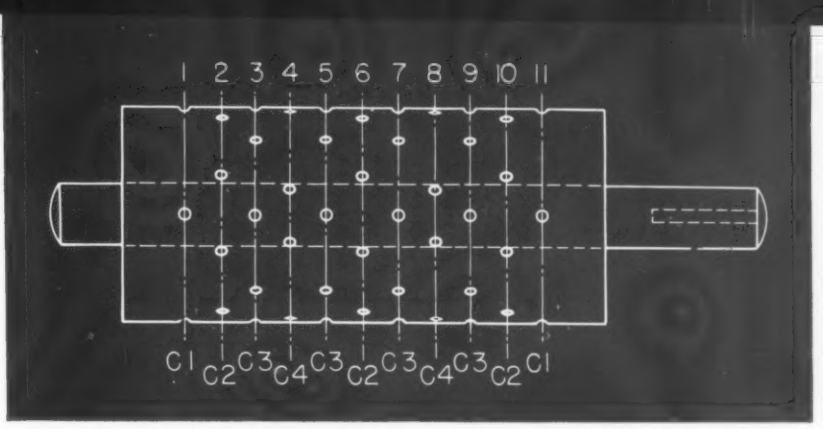


Fig. 2. The seventy-two holes drilled in the jig shown in Fig. 1 are spaced in eleven rows according to four separate patterns

in view *C*, wear is minimized by cyanide case-hardening, whereas, chrome-plating is employed for this purpose in the case of the shedder *K* illustrated in view *D*.

Shedders constructed of three or more pieces as described have been found very satisfactory and have made possible substantial savings in die costs.

Indexing Drill Jig for Radial and Longitudinal Location

By L. KASPER, Philadelphia, Pa.

When a large number of irregularly spaced holes are to be drilled or punched in a work-piece, a guide or jig is usually required. The jig shown in Fig. 1 was designed to facilitate the drilling of control cylinders such as are used on wood drilling machines, but the basic principles of the design can be applied to the drilling of multiple holes in any cylindrical part.

The control cylinders that are drilled in this jig govern the action of the wood drilling machine. Pins are inserted in the holes so that, as the cylinder rotates, each pin actuates a control mechanism that operates a drill spindle in such a way that the holes are drilled in a specified pattern. In the operation to be described, seventy-two holes of the same diameter are drilled in the control cylinder, spaced in eleven rows according to four distinct patterns, as illustrated in Fig. 2.

The design of the drill jig will be understood by reference to Fig. 1. A sliding block *B* fits in a dovetailed slot in the base *A* and is located longitudinally by an index-pin *K* which engages one of a series of holes in plate *H* and a hole in base *A* when the two holes are in alignment. Pin *K* is supported in a hole in lever *I*, which is pivoted on a stud at the rear of the fixture. The movement of lever *I* is limited by the stops J_1 and J_2.

The radial spacing of the holes is governed by index-plates, mounted on the shaft that holds the work-piece or cylinder *W*. Two bearings *D* mounted on slide *B* support the work-shaft. These bearings are provided with caps, which permit convenient replacement of the work.

Before being mounted in bearings *D*, one end of the work-shaft is provided with a group of index-plates C_1, C_2, C_3, and C_4, which are keyed and fastened to the shaft by set-screws. These plates are pinned together so that they can be removed and replaced as a unit. Brackets G_1 and G_2 support a set of cam-bars F_1, F_2, F_3, and F_4, each of which operates in conjunction with its respective index-plate. Bracket G_1 also holds the drill bushing.

Two brackets *L*, attached to slide *B*, support a pin that carries four indexing levers E_1, E_2, E_3, and E_4. Brackets *L* also support the block *N*, which holds four index-pins P_1, P_2, P_3, and P_4. These pins are so located that the lower end of

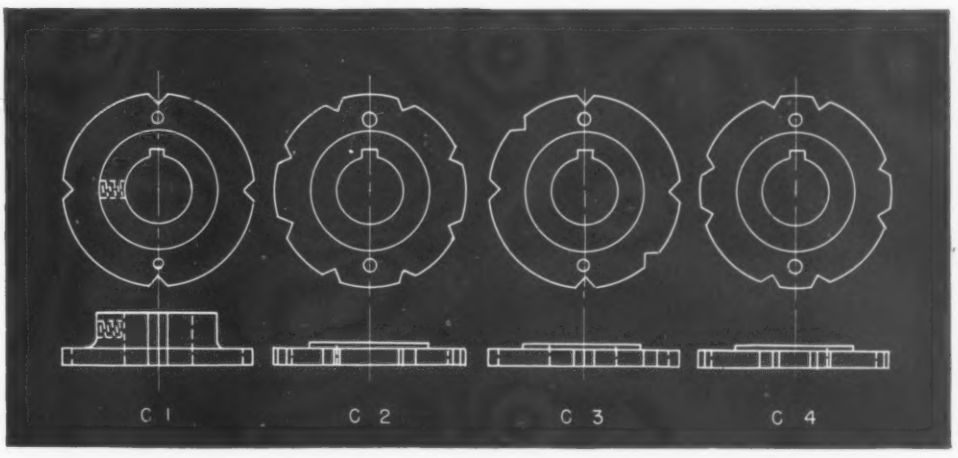


Fig. 3. Four index-plates govern the radial spacing of the holes. They are keyed together and fastened to the shaft on which the cylinder is mounted

each contacts the lower arm of its respective indexing lever E, while the upper end contacts its respective cam-bar F. Four springs M cause the upper arm of the indexing levers E to engage plates C.

Referring to Fig. 2, it will be noted that there are eleven rows of radial holes in the cylinder. In rows 1 and 11, there are four equally spaced holes. Rows 2, 6, and 10 consist of eight equally spaced holes. Rows 3, 5, 7, and 9 each have two groups of three equally spaced holes. Rows 4 and 8 have eight unequally spaced holes each. Thus, there are four basic variations in radial hole spacing, each of which corresponds with one of the four index-plates C_1, C_2, C_3, and C_4 illustrated in Fig. 3.

Referring to Fig. 1, which shows the work in position prior to drilling the first hole, the indexing procedure is as follows: When one set of holes has been drilled, the pin K is removed and lever I is moved against stop J_2, which brings the hole in the lever into alignment with the next hole in plate H. The pin K is then replaced, passing through the holes in lever I and plate H. Next, lever I is moved against stop J_1, pulling the entire slide assembly to the left and permitting pin K to enter the hole in base A, thus locking slide B in position for drilling the next set of radial holes. In this position, pin P_2 enters the recess in cam-bar F_2, permitting indexing lever E_2 to engage index-plate C_2, so that the correct spacing will be produced in the next set of holes. This procedure is followed until all the holes have been drilled.

Indexing levers E are forced into the notches in the index-plates by the action of cam-bars F, shown in detail in Fig. 4. The straight portion of a particular cam-bar holds down its respective index-pin P, Fig. 1. In this position, the pin acting on the lower arm of the corresponding lever E, causes the upper arm of the lever to be held out of contact with its index-plate. At each recess in the cam-bar, the pin P over which that particular bar passes rises, due to the action of the spring M against the upper arm of its respective indexing lever E. When a pin P rises, the upper end of its indexing lever E is brought into contact with the index-plate. The pointed end of the upper arm of indexing lever E fitting into the notches in its index-plate, positions the cylinder W radially in the correct location for drilling. The cylinder is rotated by hand as the holes are drilled.

There are, all together, eleven recesses in the four cam-bars F, one for each longitudinal position as determined by the holes in plate H. As there is one cam-bar for every pin P, each cam-bar actuates one indexing lever E, permitting engagement only when pin P enters the recess in bar F. The positions of the recesses in bars F indicate the longitudinal location at which each set of holes will be drilled, the radial spacing of the holes being determined by the particular bar and index-plate in operation. The reference letters C_1, C_2, C_3, and C_4 at the bottom of Fig. 2 indicate the index-plate which is in operation at each of these longitudinal positions. It will be noted that the numerical designations in Figs. 2 and 4 are the same, except that they are in the reverse order due to the fact that the cam-bars remain stationary, while the index-plates and the actuating mechanism move horizontally.

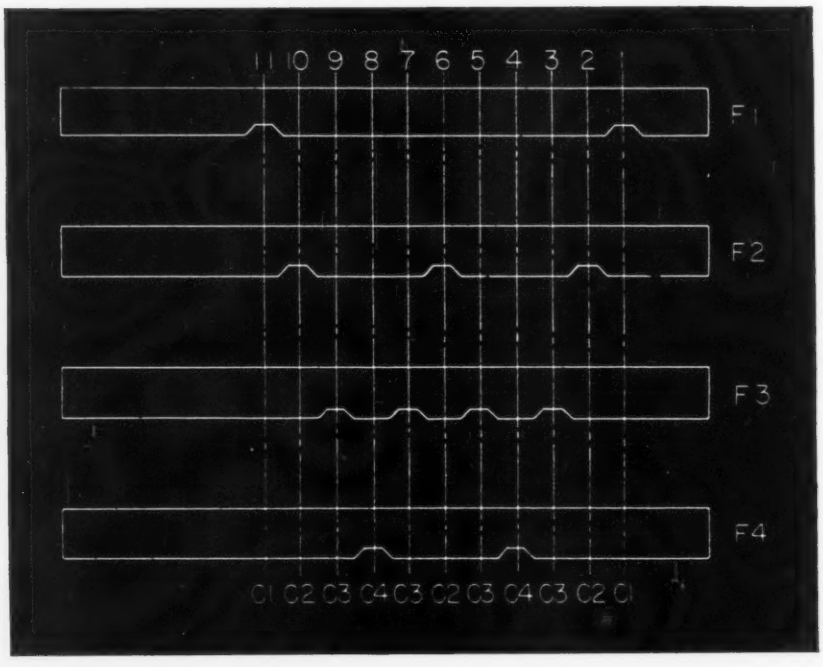


Fig. 4. Four cam-bars govern the selection of the index-plates (C). For example, when (F_1) is so positioned that pin (P_1), shown in Fig. 1, enters one of its recesses, an indexing lever is brought into contact with index-plate (C_1) and positions the cylinder radially in the correct location for drilling

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER Sales Engineering Consultant

How the Salesman Can Create Inquiries

THIS is the time for really creative sales engineering. In recent years, the prospect's "How quick can I get your Model 6 Type X machine?" has progressively changed to "No, we don't need any tools now."

Inquiries commonly develop in these three ways: (1) The prospect finds he needs a certain machine tool or other equipment and asks the supplier to quote a price and delivery date. (2) The prospect, in his search for improvement in operating efficiency, puts a machining problem up to a potential supplier. (3) The shop equipment salesman, through his own initiative, gains an opportunity to study the prospect's machining methods, thereby uncovering a need—unrecognized before—and consequently creating an inquiry.

These three ways in which an inquiry develops point directly to three levels of sales engineering. (1) With a clean-cut inquiry in black and white, considerable skill is required in a competitive market to make the sale. This type of selling has characterized a large portion of past sales effort. (2) With a problem initiated by the prospect and presented to the potential supplier, sales engineering skill is required in finding a solution, offering the best tool for the purpose, and closing the order. (3) The highest type of sales engineering skill lies in the ability of the sales engineer to gain permission to study the user's production facilities, methods, and processes, and uncover an unrecognized need. This is creative selling at its best.

How does the skilled sales engineer go about this type of selling?

First, he selects his prospect carefully, because time can easily be wasted on some prospect where the chances are nil.

Second, he sells an idea—not a machine. He sells the idea that his engineering experience and skill in the direction of money saving may help the prospect at no cost to the latter.

Third, the sales engineer must proceed, through persuasion and diplomacy, to work with the men in the prospect's factory in a careful analysis of the production problem.

Fourth, with the need developed, concentrated sales effort is required to persuade the prospect to invest money in this particular improvement at a time when investment expenses are closely scrutinized.

This type of selling often requires all sorts of ingenuity on the part of the sales engineer to get into the plant so as to demonstrate his engineering skill. Success will depend upon the proper method of approach. He may ask to inspect the operation of a machine previously sold; or he may find some weakness in the prospect's final product and express a willingness to help in its correction; or, again, he may have received a friendly tip that the prospect is having trouble cost-wise on a particular operation and offer his assistance in solving the problem.

What are the advantages of this type of creative selling? You may think that it is expensive. On the other hand, it represents a handsome sales investment because:

It establishes the sales engineer on a much higher level in the customer's mind than a mere machine or tool peddler.

It definitely places him in a superior position with respect to his competitors, and often keeps competitors out of the picture.

It greatly strengthens the individual selling morale of the sales engineer, for in every instance where he secures an order, he has not only learned to sell a machine, but what is more important, to sell an idea—a result. Nothing stimulates or strengthens a man more than demonstrating his ability to make "two blades of grass grow where only one grew before."

It enhances the position and reputation of the machinery or tool supplier, for the customer gains a lasting impression that here is a company profoundly interested in helping him realize productive efficiency and greater profit.

Many people say we must "get back to the old days of competitive selling." This is true when it refers to eagerness, skill, and persistence in fighting for the order. But what we need particularly is to reach a higher level of selling ability. Devoting a proportion of our sales time to this method of really creative selling will do much to lift our sales methods, reach a preferred position as a supplier, cut down the time ordinarily devoted to established sales arguments, and actually make orders that propagate and multiply in the future.

* * *

New Device for Checking Large Machinist's Squares

The checking of large machinist's squares used extensively in the production departments of the Warner & Swasey Co., Cleveland, Ohio, has been facilitated by a new instrument devised by H. L. Cook, a veteran in the gage department. This new device is direct-reading, and eliminates the necessity for using feeler gages and tissues in testing the accuracy of squares.

The instrument operates on the principle employed by draftsmen in checking celluloid triangles, which consists of drawing a perpendicular to a base with the triangle in one position, and checking the accuracy by reversing the position of the triangle. The square to be tested is placed against one side of a vertical pivoted bar. At the bottom of the bar there is an indicator lever with a multiplying ratio of 2 to 1, which swings to register any error in the square throughout the length of the bar. If an error reading is obtained, it is checked by making a second test with the square against the other side of the bar.

* * *

Product Design Seminar at Lehigh University

A six weeks' product design seminar has been announced by Lehigh University, Bethlehem, Pa., to prepare managers of industrial plants to initiate and administer product design projects. Sessions will begin on July 5 and extend through August 13. Registration will be limited to fifty delegates.

Checking a large machinist's square with a new direct-reading instrument

Origin of the Metric System of Length Measurement

By EDWIN F. MOSTHAF

In 1790, the French Government appointed a commission to devise a standard of length measurement. It was decided that the quadrant of the meridian should be adopted and that 0.0000001 of it should be the standard. The arc of about 9 1/2 degrees, extending from Dunkirk on the English Channel to Barcelona on the Mediterranean and passing through Paris, was selected as the one to be measured.

The actual work of measuring the arc was quite difficult and required many years. The Revolution was in progress, and the attitude of the people was unfriendly. Finally, the results were presented before a commission composed of members from various nations. After carefully reviewing and calculating the work, the length of the meridian was determined, and from it was established the meter. A platinum bar was made according to the figures given, which was the prototype of the present meter. It has been since shown, however, that the meter established is not 0.0000001 of the quadrant passing through Paris, but of the one passing through New York. The meter is equal to 39.37 inches. The metric system of length measurement is a decimal type system in which all other units are obtained by dividing or multiplying the meter by 10, 100, 1000, etc. The relation of all smaller or larger units to the primary unit is indicated by the prefix to the name of the unit. A Latin prefix denotes a subdivision of the primary unit. For example, centi means one one-hundredth; therefore, a centimeter is 0.01 of a meter or 0.3937 inch. Again, milli means one one-thousandth; therefore, millimeter means 0.001 of a meter or 0.03937 inch. A Greek prefix denotes a multiple of the primary unit. For example, kilo designates one thousand; therefore one kilometer is equivalent to one thousand meters.

The metric system was legalized in the United States by an Act of Congress in 1866. Its use in this country, however, at the present time is limited almost entirely to anti-friction bearings, optical parts, and spark plugs.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Gisholt Hydraulic Automatic Lathe

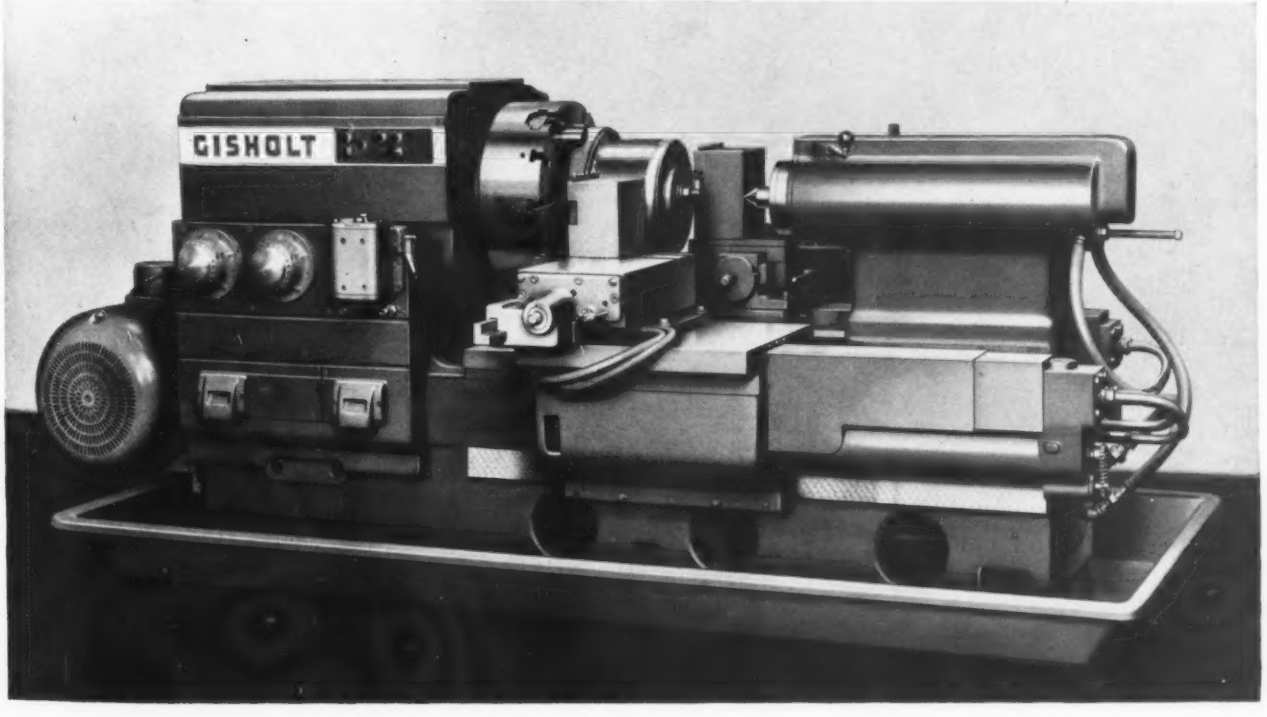
The Gisholt Machine Co., Madison 10, Wis., has just announced that it is manufacturing a No. 24 hydraulic automatic lathe for heavy-duty work. This new lathe has a swing of 35 1/2 inches over the bed ways and is especially adapted for machining such parts as tractor support rollers, Diesel-engine cylinder liners and pistons, ball and roller bearing races, aviation and gas turbine parts, pipe flanges, and large valve bodies. It has been designed to combine the ruggedness and capacity required for handling large parts with the versatility of the smaller No. 12 automatic. A motor within the range of 25 to 75 H.P. is recommended for the drive of this machine.

Standard equipment consists of front and rear carriages, each with its own auxiliary slide. Each slide has its own feed pump and controls, and can be mounted to traverse and feed at any angle to the spindle center line. Feeds are infinitely variable up to a maximum of 0.125 inch per revolution of the work.

The heavy forged steel spindle is mounted in ultra precision anti-friction bearings, with an intermediate spindle bearing designed to obtain maximum rigidity. The starting and stopping of the spindle is part of the automatic cycle, but can be controlled manually by push-buttons. Changes in spindle speed are obtained through quick-change pick-off gears, thirty-two speed changes being possible in each of the following ranges: 25 to 136 R.P.M., 38 to 208 R.P.M., 53 to 290 R.P.M., and 69 to 378 R.P.M. The spindle has an A1-15-inch American Standard nose, and the spindle hole is 3 inches in diameter. Standard chuck sizes range from 15 to 32 inches.

The standard carriage is 23 inches wide, 26 inches long, 3 inches high, and has a travel of 24 inches. The swing over the front carriage is 28 inches, and the length between centers is 36 inches. The hydraulically operated tailstock has a movement of 10 inches, with adjustable pressure. The tailstock base is manually clamped to the bed and is supported by the rear way, leaving the front way clear so that the front carriage can pass the tailstock to the extreme right-hand end of the bed. This feature gives full carriage travel for turning long work and greatly facilitates loading and unloading large and heavy work.

The lathe ordinarily requires a floor space of about 62 by 160 inches, and has a net weight, exclusive of accessories and tool equipment, of approximately 14,000 pounds. 61



Hydraulically operated heavy-duty automatic lathe brought out by the Gisholt Machine Co.

To obtain additional information on equipment described on this page, see lower part of page 234.

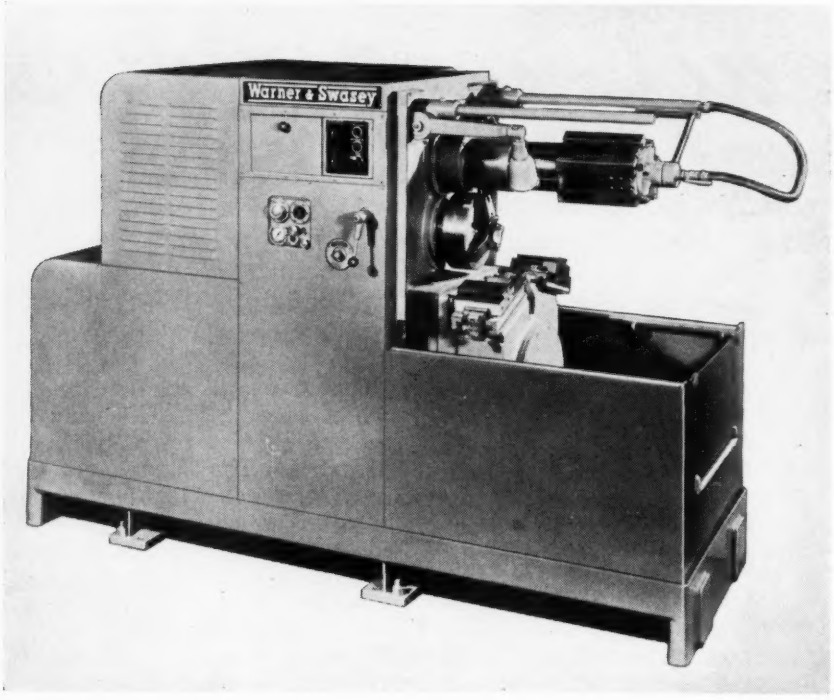


Fig. 1. Warner & Swasey single-spindle automatic chucking machine with plastic splash guards removed to show two cross-slides and five-sided overhead turret, on which a wide selection of tools can be mounted

Warner & Swasey Single-Spindle Automatic Chucking Machine

Five turret and two cross-slide tool stations provide large tool-holding capacity and set-up flexibility in the new single-spindle automatic chucking machine brought out by the Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio. This new machine is shown in Fig. 1 with its plastic splash guards removed and without any tooling on the cross-slides or turret. It is designed to handle work up to 8 1/2 inches in diameter by 6 inches long.

The spindle speed range is from 56 to 1498 R.P.M. Eight speeds are available from any given change-gear set-up through the use of four automatic changes and a "high-low" shift lever. Eighteen feeds are provided, ranging from 0.002 to 0.083 inch. All change-gears slide on splined shafts. A safety feature prevents the machine from being started when the gear-box cover is not in place. Another safety provision is the rapid traverse and indexing brake, which permits fast approach strokes without danger of damage to the tooling or work.

The cross-slide tools are adjustable longitudinally and transversely, and either slide can be selected for operation with any turret face or all turret faces, or while the turret dwells. The cross-slides can also be used to actuate facing or recessing tools mounted on the overhead turret.

The turret shaft is mounted in two large bearings designed to insure maximum rigidity. An advantage of the overhead arrangement of the tool turret is that overhang is practically eliminated, the tool-supporting holders being brought closer to the work as the diameter of the work increases.

Trip-blocks that can be easily set on a drum at the rear of the turret shaft, as shown in Fig. 2, control the feeds, spindle speeds, length of cutting stroke, and skip indexing. This control arrangement does away with changing of cams and makes it possible to change set-ups quickly and easily. The set-up controls include feed and speed selectors; automatic and hand operated switches; and forward, reverse, and index push-buttons. Operating controls include spindle and coolant control switches, and cycle start and motor control push-buttons.....62

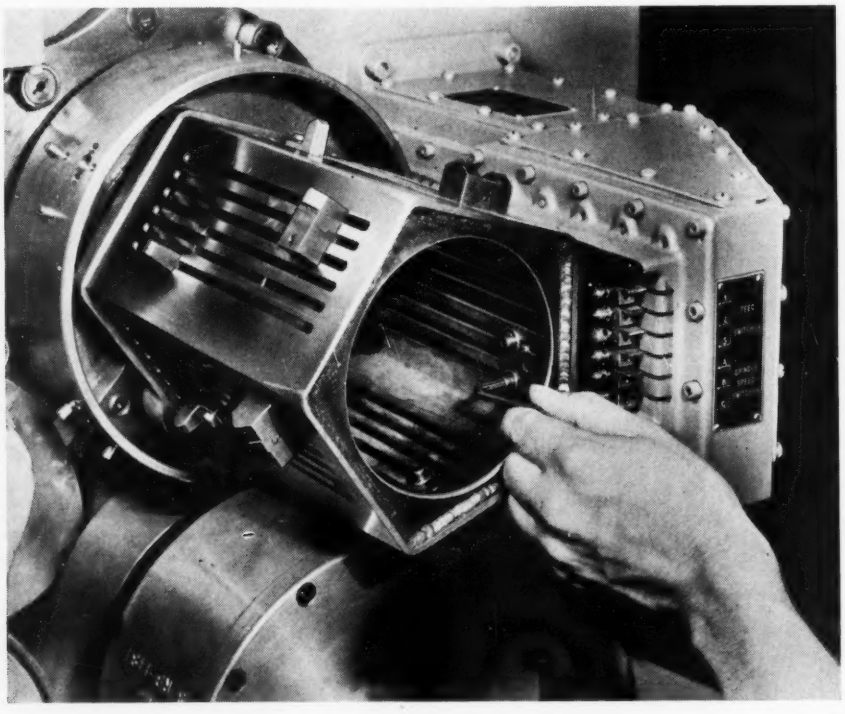


Fig. 2. Close-up view of pentagonal drum at rear of turret shaft of machine shown in Fig. 1, illustrating simple method of setting trip-block controls

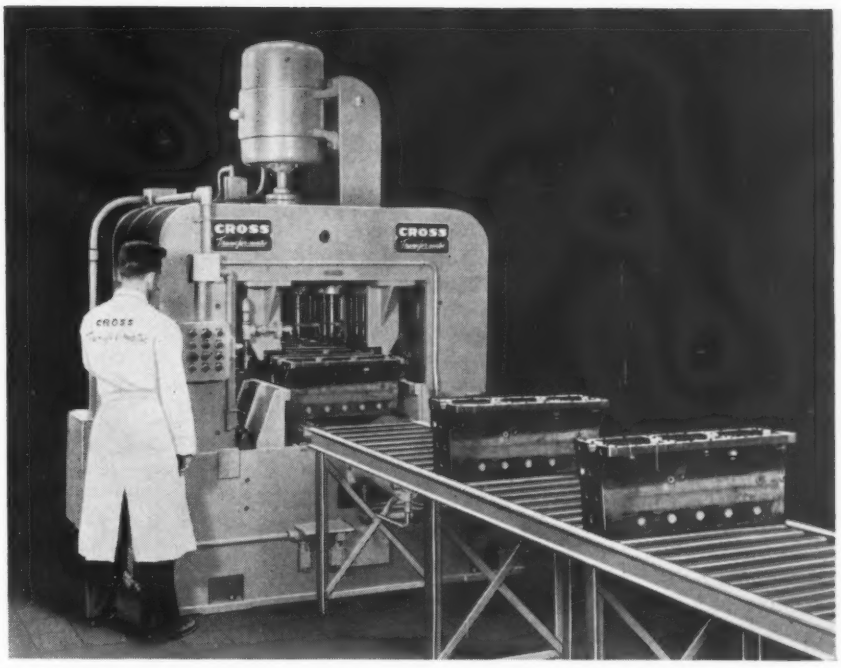
Cross Special Multiple-Spindle Tapping Machine

A special multiple-spindle machine for tapping cylinder blocks at a greatly reduced cost has been developed by The Cross Company, Detroit 7, Mich., for delivery to a large automotive manufacturer. This "Transfer-matic" machine, equipped with a continuous auto-

To obtain additional information on equipment described on this page, see lower part of page 234.

matic material-handling device, taps the pan rail and ends of 130 cylinder blocks per hour at an operating efficiency of 100 per cent.

Four stations are provided, the first and fourth being designed for loading and unloading, respectively. At the second and third stations, thirty holes are tapped in the pan rail, fourteen holes in the front face, and six holes in the rear face. The operator merely positions the block in the loading station and presses the cycle button. The parts are then automatically machined and transferred from station to station. The features include individual lead-screw feed and the use of standard Cross sub-assemblies to provide flexibility for reasonable part design changes. The interchangeability of these self-contained units also assures low maintenance costs and minimum down time. 63



Cross multiple-spindle machine for tapping cylinder blocks

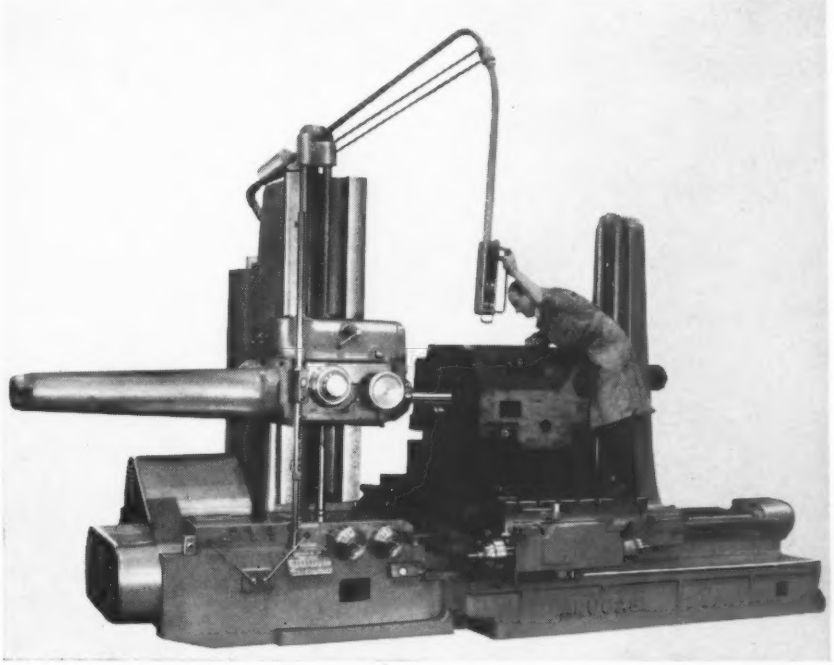
Lucas Precision Boring Mills

A complete line of precision horizontal boring, drilling, and milling machines is now being built by the Lucas Machine Division of the New Britain Machine Co., Cleveland, Ohio. This new line includes machines of 3-, 4-, 5-, and 6-inch spindle sizes in both electrically and mechanically controlled models. Besides being of new design, with compact lines, these machines also feature greater operating efficiency and increased versatility. They are equipped for automatic power positioning of both table and head. By using dial indicators, the operator can accurately repeat spacing operations, either horizontally or vertically, and thus avoid the necessity of using jigs or fixtures.

The machines are adaptable for a great variety of set-ups. They will drill, ream, stub-bore, line-bore, end-mill, face-mill, turn, and do contour work. The automatic power positioning feature makes these machines exceptionally well suited for all types of production work, in addition to being adapted for use in machine maintenance shops.

The one-piece beds of these machines are of well ribbed, deep box construction, extending continuously beneath the column and table, with two or four ways for table and saddle support. The ways of the bed, saddle, and column of the model illustrated have hard steel inserts. All other models can be furnished with flame-hardened ways. The column, saddle, table, and back-rest are designed to insure long, accurate life and maximum operating efficiency. All feeds of the head, saddle, and table are accomplished by hard-surfaced screws. The oiling systems on these machines have been designed to operate automatically.

The spindle has both high and low speeds, is nitrided, and also has a nitrided front and rear bushing. On high-speed work, the spindle is driven directly by V-belts, all vibrations, so detrimental to cemented-carbide cutters, being dampened by the flywheel action



Precision boring machine of new line built by Lucas Machine Division of the New Britain Machine Co.

To obtain additional information on equipment described on this page, see lower part of page 234.

of the low-speed gears. Pendent controls are provided on the 3- and 4-inch machines to start, stop, jog, and reverse the spindle rotation. The 4-inch Model 460, and the 5- and 6-inch machines are equipped with pendent directional control for spindle rotation, feed, and rapid traverse selection for any unit.

Work ranges of 36 by 36 inches to 94 by 84 inches are covered by this line of machines. Speeds range from 7 1/2 to 850 R.P.M. on the 5- and 6-inch machines up to 13 1/2 to 1500 R.P.M. on the 3-inch spindle machine. Angular and vertical milling attachments, combination boring and facing heads, and power and manually operated swiveling tables are provided as accessories. 64

Sundstrand "Rigidmil" Equipped for Machining Cylinder Heads

An automatic transfer type "Rigidmil" has just been built by the Sundstrand Machine Tool Co., 2530 Eleventh St., Rockford, Ill., for milling the top, bottom, and both sides of cylinder heads. The machine consists of three milling stations, one turn-over station, an idle station, and loading and unloading stations. All stations can be controlled from the master control button panel or individually from the station button control panels. The cylinder heads are shuttled from station to station by the return movement of the milling heads, making it unnecessary to have a separate transfer device. A motor-driven conveyor removes the chips from the machine.

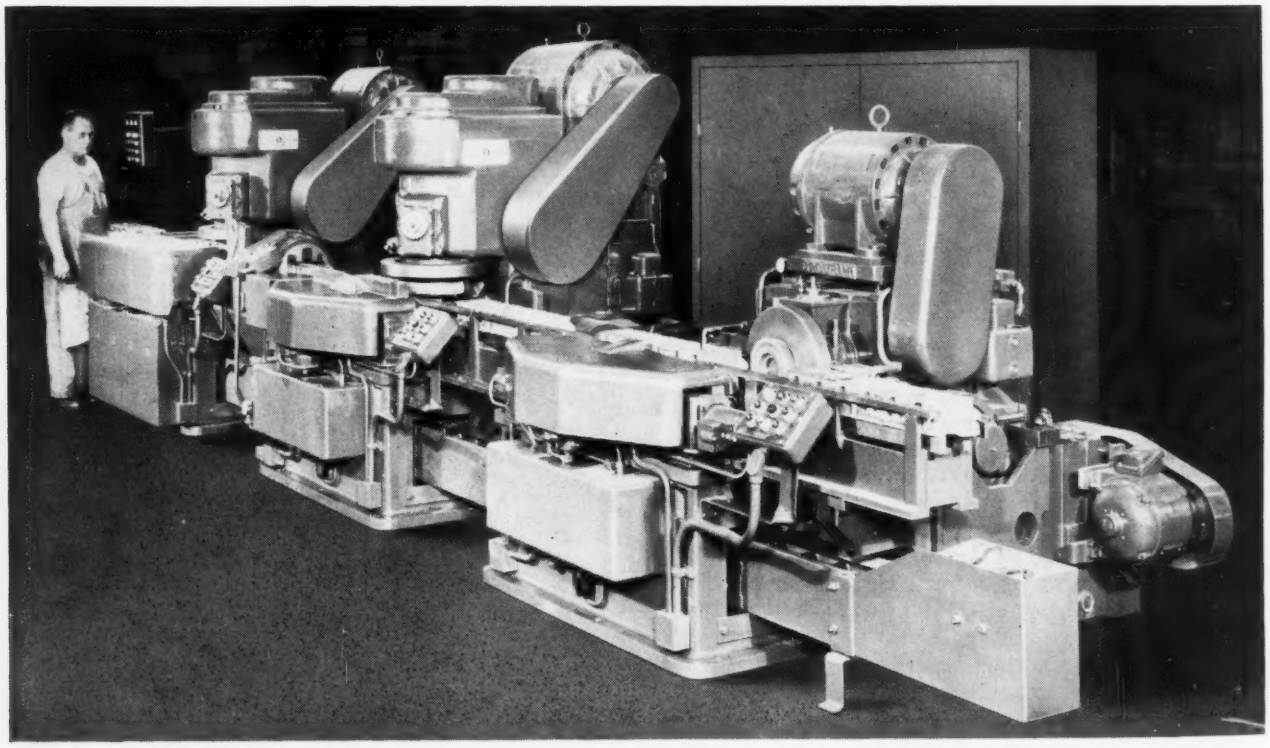
The operator simply locates the cylinder heads on the loading station and presses the cycle starting button, after which all movements become automatic. Each milling head has an automatic cycle of rapid approach, feed, and rapid return. As the rapid return movement is completed, each head moves two work-pieces into their milling position. At the same time, the finished piece is moved out ahead of the cutter, which makes cutter relief unnecessary.

All of the traveling heads are intertimed so that none will start the rapid return movement until all are ready, thus making a pile-up of work-pieces at any one station impossible. A 25-H.P. head with one vertical and one horizontal spindle is used at the first milling station; a 40-H.P. head with one vertical spindle at the second milling station; and a 15-H.P. head with one horizontal spindle at the third milling station. A safety switch at the unloading station prevents another cycle of operations from being started until the finished piece has been removed to the outgoing conveyor. 65

Norma "Stability Tested" Grease for Bearing Lubrication

The Norma-Hoffmann Bearings Corporation, Stamford, Conn., has announced that the Norma G-66 "Stability Tested" grease is now available for bearing lubrication. This grease was originally developed for use in the company's own ball and roller bearings, to provide a stable, thoroughly clean lubricant of suitable consistency to maintain lubrication over wide temperature ranges without separation, drying out, or hardening. Performance records have shown that bearings prepacked with this grease have been giving continuous performance for over ten years with the original grease.

This specially compounded grease is highly resistant to oxidation. It is insoluble in water, and will not emulsify or aerate in the presence of condensed moisture. The grease is available to bearing users for lubricating grease-



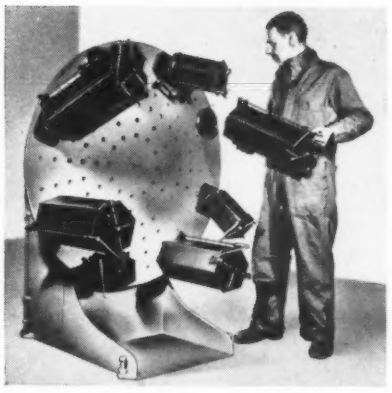
Automatic transfer type "Rigidmil" built by the Sundstrand Machine Tool Co., for milling cylinder heads

To obtain additional information on equipment described on this page, see lower part of page 234.

packed bearings, as well as unsealed bearings. It is supplied in tubes for servicing of bearings in the plant and field, and in larger containers where greater quantities of grease are required.....66

Multi-Barrel Tumbler for Mass Finishing

A multi-barrel deburring and polishing machine for the mass finishing of metal and plastic products is announced by the Hungerford Corporation, Big Flats, N. Y. With this equipment, up to fifteen different parts can be handled at the same time, without mixing, and each can be tumbled in the manner best suited to its requirements. The variations in operation include wet or dry tumbling and rotary, centrifugal, or end-to-end actions, as well as combinations of these actions. Thus, all degrees of contact and impact can be obtained, and delicate parts that heretofore have required deburring and polishing by hand can now be machine-processed without danger of deformation.



Hungerford multi-barrel tumbler

A circular mounting plate with multiple perforations at the center and at six distances from the center for attaching the barrels is rotated at a fixed speed. The barrels are of various lengths, diameters and cross-sectional shapes. Seventy-three standard units are available. They can be mounted at different angles to the plate.....67

Pratt & Whitney Multiple-Station Piston Gage

A multiple-station gage designed to check nine critical dimensions of an automotive piston simultaneously has been made by Pratt & Whitney Division of Niles-Bement-Pond Co., West Hartford 1, Conn. Three P & W gaging mediums ("Air-O-Limit," "Electrolimit," and multiple contact) are combined in this production gage.

In operation, the inspector simply places a piston on the automatic loading mechanism and watches the lights and meters on the instrument panel. The piston is drawn automatically into the gaging position, where the nine dimensions are gaged simultaneously. Green lights indicate under-size and red lights indicate over-size dimensions. The three meters show the variation in pinhole diameter, skirt taper, and skirt diameter, respectively.....68

"Livermont" Analyzer for Powered Torque Tools

Richmont, Inc., 2810 E. Eleventh St., Los Angeles 23, Calif., has announced a testing device for accurately checking the tightening capacity, range, and adjustment of powered torque tools with predetermined standards.

On direct drives, this new "Livermont" analyzer will show the torque at which the clutch releases and at what rate torque increase is accomplished beyond the releasing point if held in engagement. On cushion clutch drives, it will show at what torque the clutch releases and when im-

Pratt & Whitney multiple-station gage for automatically checking automotive pistons

"Livermont" analyzer for powered torque tools, announced by Richmont, Inc.

To obtain additional information on equipment described on this page, see lower part of page 234.

pact begins; at what rate torque is gained after the impact starts; and the ultimate torque capacity of the tool. On straight impact applications it reveals the power delivering capacity of impact, whether air- or electric-driven; the time required to reach a certain torque; and the ultimate torque capacity of the tool.

The analyzer can also be used on the high rotary-speed kinetic-energy tools which deliver their ultimate force with the first cycle and less torque on subsequent cycles unless the tool is permitted sufficient time to return to maximum speed. The analyzer is mounted on a portable stand. Over-all measurements are height, 3 feet 6 inches; length, 2 feet 2 inches; and width, 1 foot 8 inches. The weight of the equipment is 195 pounds. 69

Colonial Universal Broach-Sharpening Machine with "Step-Stop" Micro-Feed

A universal broach-sharpening machine equipped with "step-stop" micro-feed, designed for faster sharpening of both internal and surface broaches up to 36 inches in length and 6 inches in diameter, has been added to the line of the Colonial Broach Co., Detroit 13, Mich. Savings up to 25 per cent in sharpening time for various types of broaches, including round, serrated, spline, and similar types, are claimed to be possible with this machine as the result of the new "step-stop" micro-feed.

The broach is held between the motorized two-speed headstock and the quick-release spring-loaded center tailstock. New type "center point" steadyrests provide support for the broach opposite the wheel and on the under side of the broach.

The "step-stop" micro-feed is equipped with a micro-feed handwheel which controls the setting of a plunger in the "step-stop" control. A bracket comes in contact with the plunger and limits the travel of the wheel when the "Easy-swing" hand-lever is operated. Setting of the bracket for any size broach is made with the handwheel at full depth on the largest-diameter tooth on the broach and with the plunger all the way out. The additional feed required from tooth to tooth as the broach diameter decreases is provided by the micro-feed handwheel.

For grinding flat broaches, headstock and tailstock are replaced by a magnetic chuck. The head movement for flat broach sharpening is controlled by a second handle on the head. 70

Universal broach-sharpening machine with "step-stop" micro-feed built by the Colonial Broach Co.

Deep-throat press announced by Service Machine Co.

"Rousselle" Deep-Throat Press

The Service Machine Co., 7627-33 S. Ashland Ave., Chicago 20, Ill., has added a new 5-ton "Rousselle" deep-throat press, designated No. OG, to its regular line of presses. This versatile press is available in both bench and floor models. The 12-inch throat permits working to the center of 24-inch sheets, so that large bulky work, as well as regular punch press jobs, can be handled.

The frame is an extra heavy, ribbed semi-steel casting, designed to provide rigidity and strength. The unusually large, heavy-duty clutch can be easily set for single stroke or continuous operation, and operates at a speed of 250 strokes per minute. The floor model weighs approximately 700 pounds. 71

Covel Precision Boring Machine

Precision boring machines designed for accurate, high-production boring, turning, and facing, which feature new type electro-hydraulic controls that permit instant selection of any one of three automatic cycles, as well as convenient "inching" control for setting-up operations, have recently been announced by the Covel Mfg. Co., Benton Harbor, Mich.

To obtain additional information on equipment described on this page, see lower part of page 234.

Precision boring machine brought out by the Covel Mfg. Co.

Cincinnati tool grinder with mist type coolant attachment

In addition to the new controls, all push-button stations are grouped on one inclined panel within easy reach and in clear view of the operator. The cartridge type spindles have permanently lubricated, pre-loaded bearings, and the ways are provided with automatic lubrication. Spindle motors are mounted on bridges or directly above the spindles for convenient maintenance and to permit the use of shorter, more efficient V-belt drives. These precision boring machines are available in several models, of both single- and double-end types. The illustration shows the No. 51 single-end model. 72

Mist Type Coolant Attachment for Cincinnati Tool Grinder

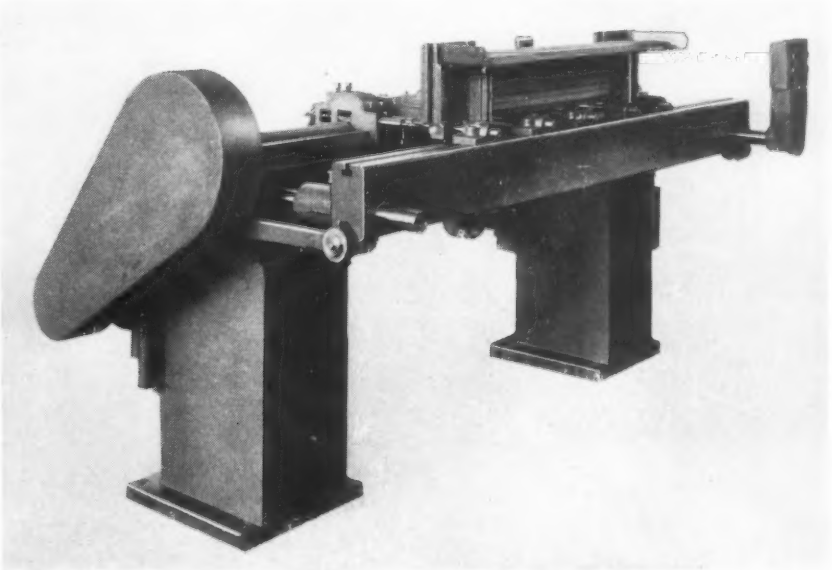
The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, has recently announced a new attachment for use on its No. 2 cutter and tool grinder, which comprises a mist type coolant system for carbide grinding. It consists primarily of a floor unit composed of a coolant tank, pump, and suction fan; a large-diameter flexible return tube and a small-diameter supply tube to the grinding wheel; and a guard that completely surrounds all but the face of the wheel.

With this equipment, a thin stream of coolant is directed to the rapidly rotating wheel, which transforms it into a fine mist. This mist, instead of being thrown off on the machine, operator, and work, is immediately returned through the suction tube to the coolant tank. Thus a small amount of coolant is in continuous circulation.

This attachment offers the dual advantages of wet and dry grinding. Since the only connection with the machine is the coolant guard, it can be applied to any Cincinnati No. 2 cutter and tool grinder, and can be readily set up and removed when it is desired to change from high-speed or carbon steel cutters to carbide cutters, and vice versa. 73

Moline Special Drilling Machine

The Moline Tool Co., 100 Twentieth St., Moline, Ill., has recently announced a special "Hole-Hog" machine with magazine feed, designed for drilling and counterboring rivet holes in wooden slats for the conveyor belts of harvesting equipment. While developed for this special job, the machine is readily adaptable for drilling steel or aluminum strips having dimensions that are comparable with those of the wooden conveyor slats.



Special drilling and counterboring machine built by Moline Tool Co.

To obtain additional information on equipment described on this page, see lower part of page 234.

This machine is designed with a modified form of the Moline spiral drive for in-line spindles. It has a rail which carries horizontal in-line drill spindles and a magazine type work-holding device which presents one piece to the drills at each operating cycle. Since pieces of several lengths are handled, provision is made for adjusting the work-holding magazine to suit, the maximum length accommodated being 59 inches. Adjustment of the center distances of the in-line drill spindles makes it easy to set the machine up for different types of slats or for various numbers of drills. The minimum center distance between adjacent spindles is 1 inch for the spindle heads used on this particular machine.

When the machine is in operation, the drills rotate continuously, but have no feed travel. The work-feed mechanism is actuated by a crank motion driven by a small motor to produce the required reciprocating action. This machine will normally drill and counterbore from 1000 to 1400 pieces per hour, depending upon the quality and uniformity of the material being drilled. 74

Hartford Automatic Thread-Rolling Machine

The Hartford Special Machinery Co., Hartford 5, Conn., has announced a new high-production thread-roller for rolling threads on machine screws in sizes from No. 2 to No. 10 at the rate of from 120 to 150 pieces per minute. The machine has a thread length capacity of 1/8 inch to 1 1/2 inches. It will roll threads on common screws, and gimlet-point and self-tapping drive screws, as well as a wide variety of special products.

The Model 190-H machine will roll Class 3 fit threads consistently, being limited only by the accuracy of the blanks used. The threading dies used are standard sizes, of the flat type. Die pockets are precision fitted, eliminating the necessity for shimming and squaring. The dies can be adjusted while the machine is running to control the accuracy of the thread fit. Provision is made for quick changing of the thread-rolling dies.

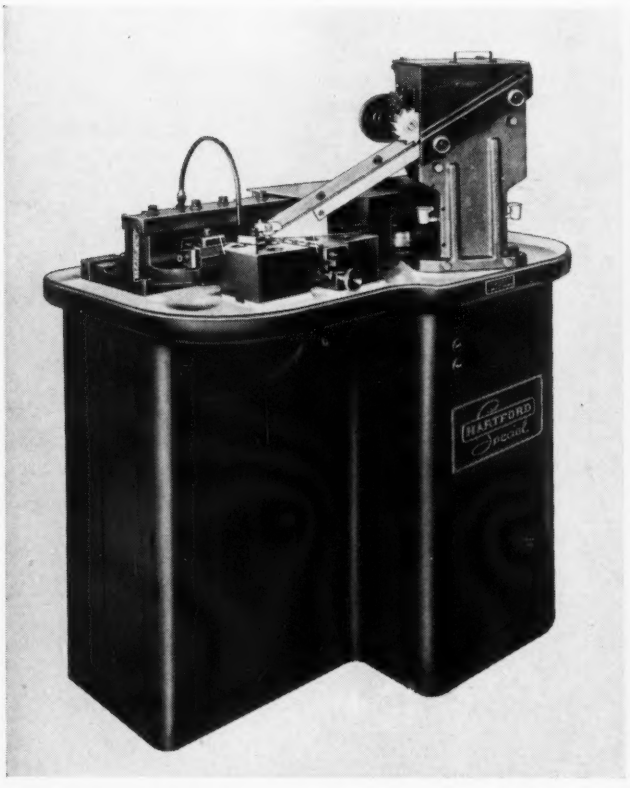
The machine has several outstanding features, including automatic hopper feed with a notched clearing wheel. A filtered lubrication system carries oil to all important parts and supplies clean cutting oil to the dies, greatly prolonging their life. The ram carrying the moving die operates in a milled and hand-scraped way to reduce friction. The thread-roller requires a floor space of only 4 by 5 feet, and is designed to keep work at a table top level, where the operator can readily check it. Finished pieces are carried by a funnel directly into a tote box designed for easy handling. 75

Cleveland Tramrail Crane with Rotating Carrier

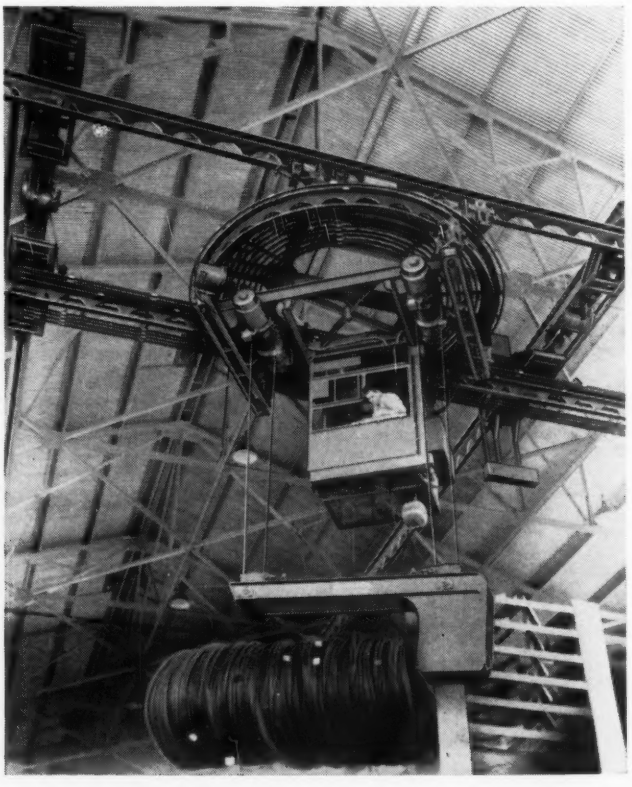
The Cleveland Tramrail Division of Cleveland Crane & Engineering Co., Wickliffe, Ohio, has brought out a tramrail crane with rotating carrier designed for handling coiled rod and wire. This crane and its equipment is intended to be used in picking up coils of rod from incoming railroad cars, turning them 90 degrees, and placing them in large storage bins.

The rod is handled by a hairpin type hook which is tilted when it is being inserted in or drawn away from the coils.

All motions of the equipment are controlled by the operator in the cab attached to the carrier. The cab is of the open type, with

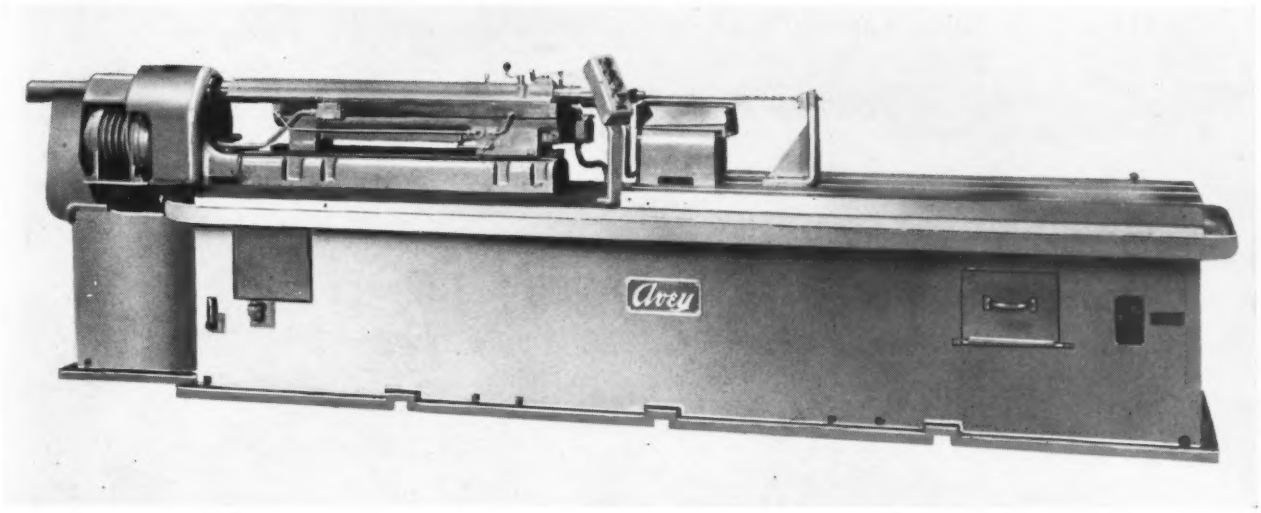


Hartford automatic thread-rolling machine



Cleveland tramrail crane with rotating hairpin-hook carrier

To obtain additional information on equipment described on this page, see lower part of page 234.



"Aveydraulic" deep-hole drilling unit brought out by the Avey Drilling Machine Co., Inc.

landing platform, and has glass and grating in the floor. A safety switch permits stopping all motions in case of an emergency. A motor-driven horn and flood light are also provided. This unit was designed to carry 3500 pounds of rod. 76

"Roto-Matic" Milling and Centering Machine

A "Roto-Matic" machine designed for continuous rough- and finish-milling and centering both ends of work-pieces simultaneously has been brought out by the Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis. The number of work stations in the rotary, drum type fixture of this new machine is determined by the size of the work-piece.

During the operating cycle of the machine, each station of the fixture picks up the centering heads. While the centering heads are being carried upward, the centering spindles are fed into the work by means of stationary cams to produce a center of predetermined depth. The centering heads are then retracted, released, and returned to their low position by gravity. Shock produced when the heads are lowered is absorbed by air cylinders which act as dashpots.

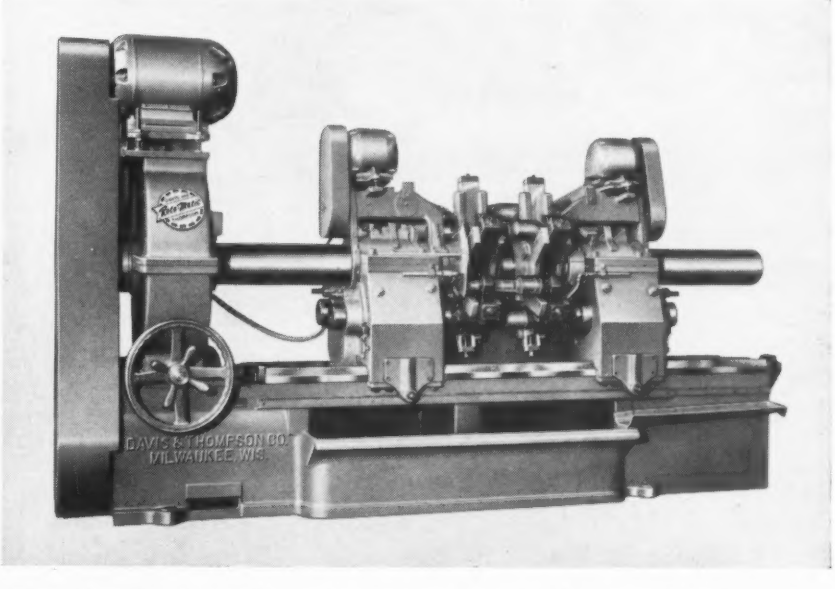
Work-pieces varying in length from 12 to 45 inches can be accommodated on a machine with a standard length bed. Special length beds can also be provided to handle longer work. When six-station fixtures are used, work-pieces up to 4 inches in diameter can be accommodated. Using a cutting speed of 10 inches per minute, a production of fifty pieces per hour can be obtained. When eight-station fixtures are provided, work-pieces up to 2 1/2 inches in diameter can be accommodated. A production of sixty-five pieces per hour is obtained with a cutting speed of 10 inches per minute.

The fixtures are of the automatic centering type, using a right- and left-hand screw with two vee jaws. Automatic clamping is adaptable when small parts are being handled. This type of clamping is most practical when the pieces are being machined on a production basis. 77

Deep-Hole Drilling Unit

The Avey Drilling Machine Co., Inc., Cincinnati 1, Ohio, has brought out a special deep-hole drilling unit known as the "Aveydraulic." This unit has a capacity for drilling a 7/16-inch hole in steel to a depth of 30 inches or more without rotating the work. It is equipped with a new "Torquematic" control which provides automatic withdrawal of the drill during deep-hole drilling operations. Automatic withdrawal of the drill occurs only when actually necessary, due to clogging of chips, hard spots in the metal, etc.

The drilling unit comprises a hydraulic feed with a V-belt drive from a 2-H.P. push-button controlled motor, and is mounted on a steel fabricated base. 78



"Roto-Matic" milling and centering machine announced by Davis & Thompson Co.

To obtain additional information on equipment described on this page, see lower part of page 234.

Hammond Semi-Automatic Polishing and Buffing Equipment

Four new two-spindle, manually indexed, semi-automatic machines have recently been brought out by Hammond Machinery Builders, 1614 Douglas Ave., Kalamazoo, Mich., for use with any polishing and buffing lathes employing wheels or abrasive belts and back-stands. They can also be used with contour finishing machines. The machines are especially adapted for use in production polishing and buffing of such parts as hub caps, pots, pans, lamp bodies, plumbing fixtures, etc.

The Model SE2PF machine illustrated consists of a base with two cross-slides, set at an angle of 90 degrees to each other, which facilitate positioning the work and compensating for wheel wear. Vertical adjustment provides means for locating the work at exactly the correct height for the polishing lathe. Power for driving the two work-holding spindles is supplied through the medium of a 1/3-H.P., 1750-R.P.M., totally enclosed motor.

The two-spindle head is manually indexed and locked in each position. Both spindles can be supplied for vacuum-chuck operation if desired. The machine is adaptable for work up to 11 inches in diameter. A retractable floating slide, located between the base unit and work-head, permits the head to float on non-concentric work. A finger-tip operated quick release mechanism allows the head to roll away from the wheel when the polishing operation is completed. 79

Acme Power Shear with Self-Contained Direct-Drive Unit

A new power-operated, 16-gage capacity metal shear with self-contained direct-drive unit has recently been announced by the Acme Equipment Co., Inc., 126 S. Clinton St., Chicago, Ill. The illustration shows the shear with the front guard removed to permit viewing the drive unit. This unique drive consists of a precision-cut hardened-steel worm and bronze worm-gearing; a sliding four-way clutch; and a driver and cam, which give the shear a positive, smooth, direct action at a slight pressure on the foot-treadle. All working members of the drive unit are enclosed and run in oil.

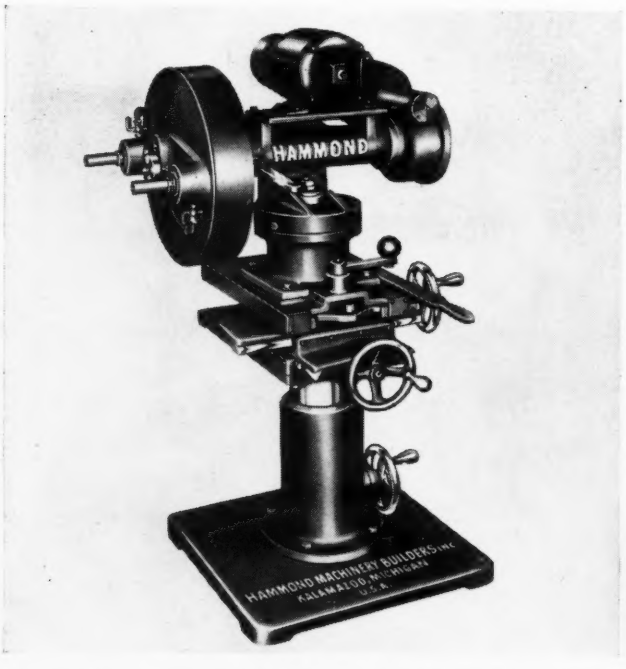
The knife bar takes a smooth, even cut and returns to the top position each time the foot-treadle is depressed. The regular operating cycle of the shear is sixty strokes per minute, but this speed can be varied if desired. The shear is available in cutting lengths of 36, 42, and 52 inches. Power is furnished by a 2-H.P. motor for the 36-inch model and by a 3-H.P. motor for the two larger sizes. 80

Lima-Hamilton Scroll Shear for Cutting Tin Plate

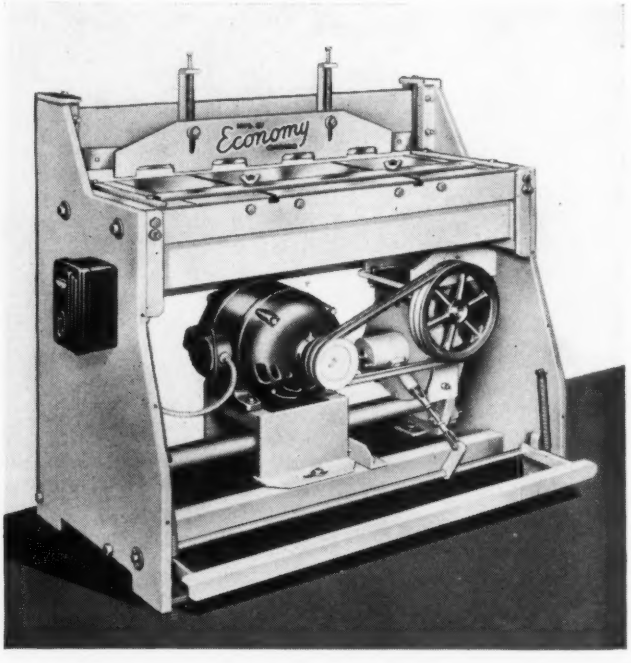
A scroll shear designed for the rapid, economical cutting of tin plate for producing can ends or for blanking tongued bodies for rectangular, round, or tapered cans has been added to the line of the Lima-Hamilton Corporation, 60 E. 42nd St., New York 17, N. Y. It is claimed that the production of scroll-cut strips, instead of straight-cut strips, results in a saving of from 4 to 7 per cent in the amount of tin plate required for can ends, bottle caps, and similar products.

The machine can be equipped either for hand-feeding or to operate with an automatic sheet-feeder. In both cases, the sheets to be cut are pushed back against positive stops, which insure accurately spaced cuts.

The shear will handle sheets from 25 to 36 inches wide and from 25 to 36 inches long. It can be operated at speeds of 60 to 100 strokes per minute, and is driven by a 3-H.P. motor. The minimum double-row scrolled strip width is 4 1/2 inches, and the maximum 9 1/2 inches. The height of the



Hammond semi-automatic machine for polishing and buffing



Acme power shear with self-contained driving unit

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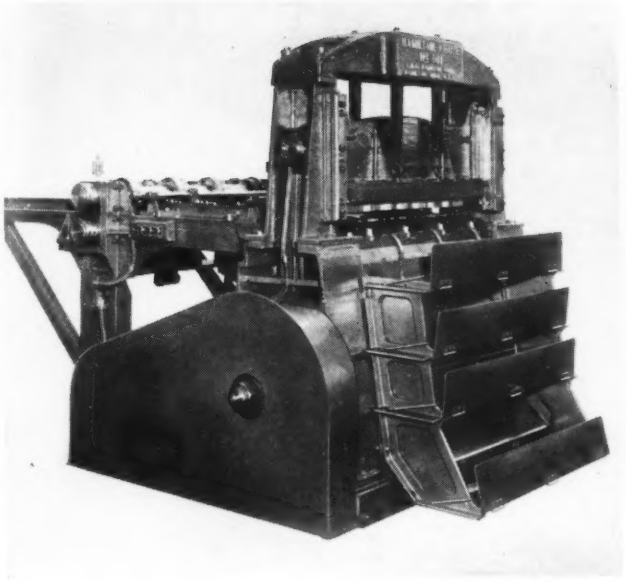
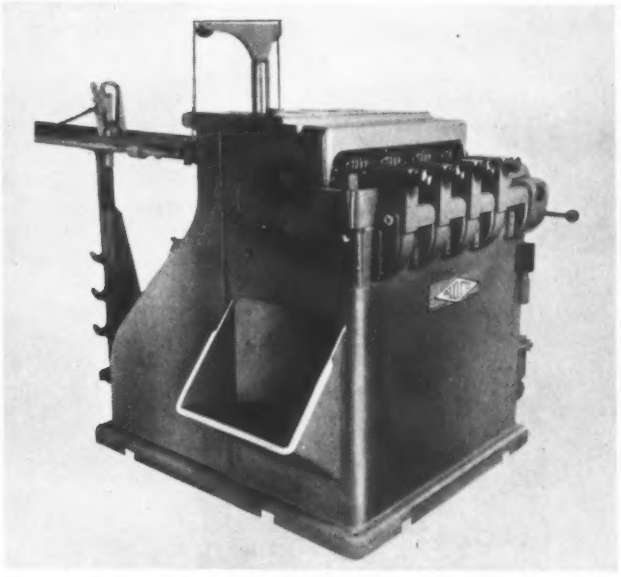


Hamilton-Kruse scroll shear for cutting tin plate into pieces for can ends and bodies



"Bar-Matic" forming and cutting-off machine brought out by the Producto Machine Co.

table above the floor is 40 1/2 inches; the floor space required, 125 by 72 inches; and the weight of the complete machine is about 8500 pounds. ----81

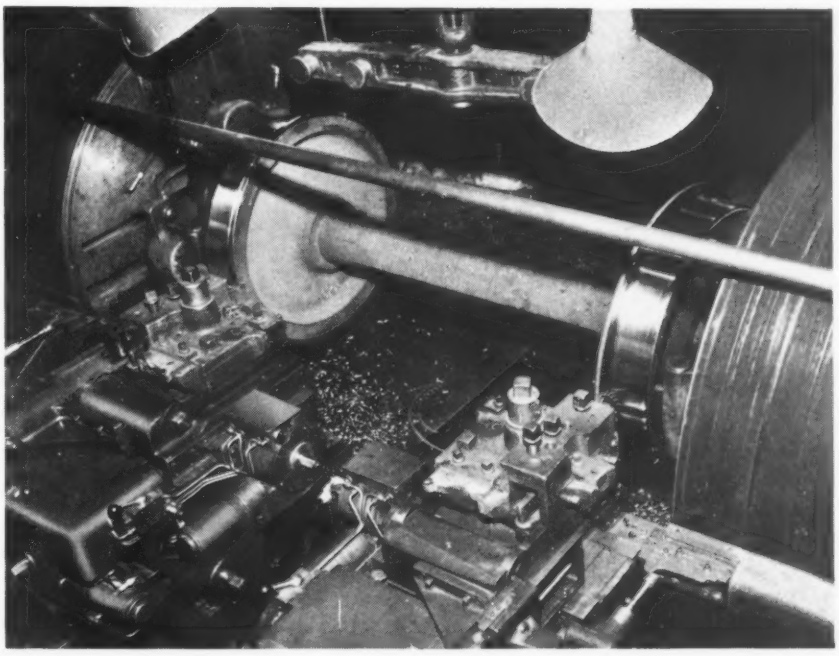
Producto "Bar-Matic" Forming and Cutting-Off Machine

The Producto Machine Co., 990 Housatonic Avenue, Bridgeport, Conn., has developed a new type four-spindle machine that is to be known as the "Bar-Matic." This machine is designed for high-speed external forming, grooving, beveling, chamfering, and cutting-off operations on bar stock. One of the outstanding features of the new machine is the bar feed, operated by a low air pressure system. This arrangement provides for rapidly feeding four 12-foot bars simultaneously to adjustable positive stops. Four sets of forming and cut-off tools are mounted on a horizontal slide, which is cam-operated longitudinally. This arrangement assures preservation of initial accuracy, regardless of temperature conditions.

Spindle speeds are infinitely variable, and range from 900 to 2000 R.P.M. Cycle changes are instantly obtained by handwheel control without stopping the machine. Complete parts, formed and cut off with a high degree of accuracy, can be produced on the "Bar-Matic" at the rate of 1400 to 2400 pieces per hour. The machine has a capacity for producing work up to 5/8 inch in diameter, with a cut-off length of 6 5/8 inches. ---- 82

Car-Wheel Lathe Equipped with Hydraulic Profiling Attachment

Car-wheel lathe equipped with tread profiling attachment, recently manufactured by the Niles Tool Works Co., Lima-Hamilton Corporation, Hamilton, Ohio, to specifications of the Baltimore & Ohio Railroad Co. The profiling attachment is hydraulically operated, and is designed to machine the treads of the wheels to a profile that is an exact duplicate of that of the templet used. It permits carbide tools to be used for turning steel car wheels at speeds of 150 to 195 feet per minute, with feeds of 1/4 to 1/2 inch per minute. This new equipment has eliminated the use of finishing and forming tools. The single tool bit of the new attachment completes, in one cut, the profiling as well as the finishing and flanging operations, which required four cuts on the machines previously used. ----83



To obtain additional information on equipment described on this page, see lower part of page 234.

NEW Polishing and Finishing Machine

CAPACITY . . . spindle takes collets for up to 1" diameter stock. Swing over bed 9¾" diameter; over rest, 7¾" diameter.

BROWN &

Here's 3-way improvement for your screw machine department

- ***Faster Burring***
- ***Faster Polishing***
- ***Faster Filing***

A NEW MACHINE FOR EFFICIENT POLISHING AND FINISHING OF SMALL PARTS

This new addition to the Brown & Sharpe line has three special features that make it extremely advantageous for general all-around polishing and finishing of small parts.

1. A compact, completely self-contained design that streamlines operations. It permits operator to work easily and comfortably when sitting or standing. Foot pedal control of collet and brake leaves operator's hands free to load, perform necessary operations and remove work.

2. Three spindle speeds... up to 4500 R.P.M. ... make it unusually flexible and versatile ... suitable for a wide range of materials and operations.

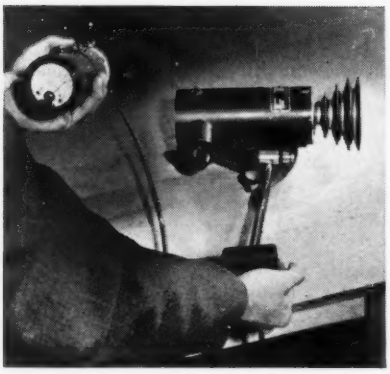
3. Only the spindle is started and stopped for inserting and removing work—reducing inertia, wear, and motor heating. Constant speed motor runs continuously with V-belt drive released by the foot pedal.

Here's an opportunity to round out the efficiency of your screw machine department with only a modest investment. Write for complete details. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

QUICK FACTS ON CONVENIENT FEATURES

1. Spindle driven by 3 step V-belt cone pulley enclosed by guard. Spindle is mounted on ball bearings. **2.** Spindle nose is threaded for chuck or other workholding device. **3.** Readily adjusted tool rest for burring, hand shaving, etc. **4.** Convenient work tray provides ample space for work pieces. **5.** Knee space permits sitting comfortably at work. **6.** Convenient start-stop switch for driving motor. **7.** Spindle speeds quickly changed through V-belt and cone pulleys. **8.** Built to typical Brown & Sharpe quality standards that assure extra years of productive service.

SHARPE B·S

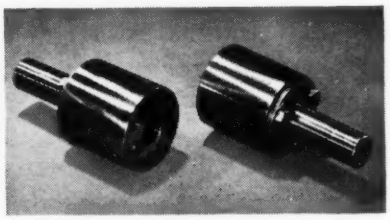


Vibration Integrator and Pick-Up

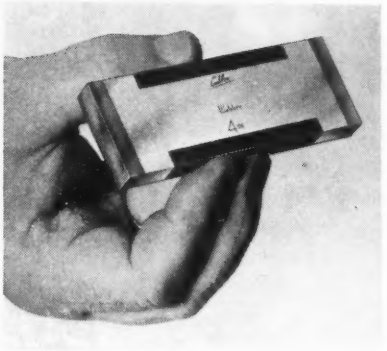
Vibration integrator and calibrated vibration pick-up developed by Hermon Hosmer Scott, Inc., 385 Putman Ave., Cambridge 39, Mass., for use in measuring vibration displacement, velocity, and acceleration in the audio-frequency range. These instruments are used in connection with the company's sound level meter. The instruments illustrated can be used to measure displacements from 0.14 micro-inch to 0.028 inch; velocities from 51.3 micro-inches per second to 10.3 inches per second; and acceleration from 0.15 inch per second per second to 3900 inches per second per second over a frequency range of 25 to 3000 cycles. Each operation simply requires the vibration integrator to be inserted in place of the microphone on the sound level meter. A table is supplied in connection with the instrument for converting decibels to units of displacement, velocity, and acceleration. 84

Marcellus Releasing Tap-Holder

Releasing type tap-holder of simplified design made by the Marcellus Mfg. Co., Belvidere, Ill. A hole all the way through the holder allows a new tap, or even a broken tap, to be held with any desired length projecting from the holder. The shank of the holder is designed to allow a movement of about 3/32 inch in any direction in order to permit alignment of the tap with the



hole in the work. The actuating dog can be set to release automatically within 0.005 inch. The holder is designed for either right- or left-hand taps. It can be readily adapted for use as a non-releasing type of holder if desired. 85



Webber Insulated Gage-Block

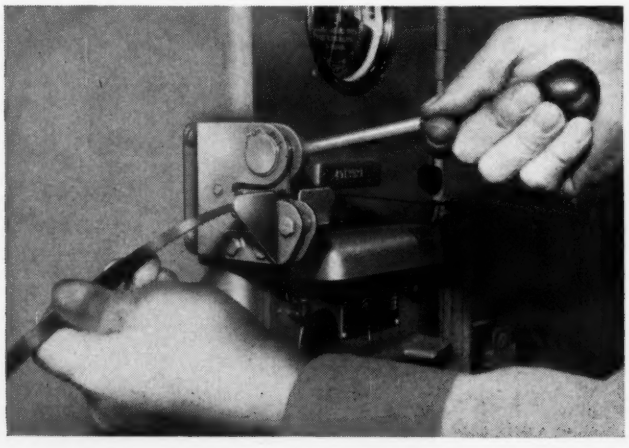
"Thermo-Guard" gage-block designed to eliminate the necessity for allowing blocks to cool off after handling and before making a critical inspection. The heat transmitted from the hands can cause an ordinary 4-inch steel block to grow 0.00005 inch in fifteen seconds. To overcome this, all 2,- 3-, and 4-inch steel and carbide "Thermo-Guard" gage-blocks are inlaid with two insulating strips such as shown in the illustration, so that the blocks are completely insulated from the heat of the hand. This new development is of particular interest to toolmakers who must work in split tenths and in dimensions above 1 inch. These gage-blocks are made by the Webber Gage Co., 12900 Triskett Road, Cleveland 11, Ohio. 86

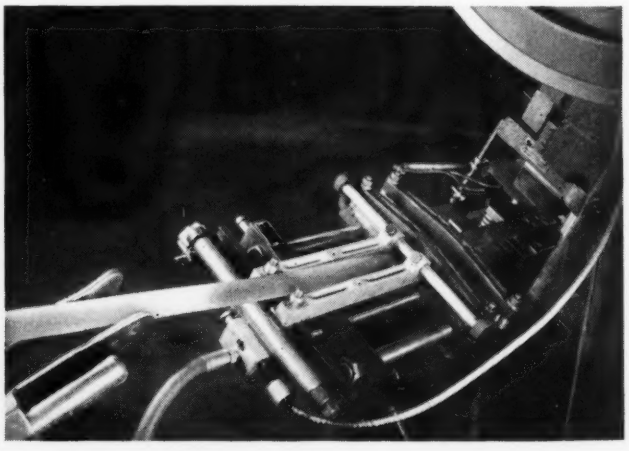
DoAll Shear for Saw Blades

An improved type of cam- and lever-actuated shear that cuts off flat strip stock and band-saw blades with punch and die precision, announced by the DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. The chief use of this new shear is in cutting off band-saw blades so that they will be square and flat, preparatory to welding them into a band. A piece 1/8 inch wide is removed from the blade, so that an old weld can be cut out, and at the same time, the blade ends are squared in preparation for a new weld. The shear will take blades up to 0.045 inch thick and 1 1/4 inches wide. It can be mounted on the saw or permanently mounted on the wall or bench in a convenient location. The three hardened shear blades are easy to remove and sharpen on a bench or surface grinder. The work can be accurately positioned by a squaring plate. 87

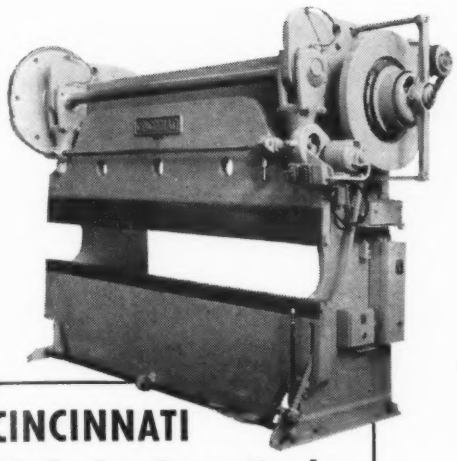
Automatic Air Feed for Presses

"Feedmaster" air-feed unit for presses, designed to feed sheets, channels, bars, etc., in a wide range of thicknesses and widths. This unit weighs only 50 pounds, and can be quickly attached to punch presses, drill presses, spot-welders, and other equipment. The length of feed can be adjusted to micrometer accuracy while the unit is in operation. Under normal shop air pressures, the feed unit can be operated at 300 strokes per minute, and will handle stock up to 1/4 inch in thickness. The Model F-3 unit regularly takes stock up to 8 inches in width, and the capacity can be increased to 15 inches by a simple attachment. The unit can be mounted to operate left to right, right to left, front to back, or push-pull on any press. Manufactured by Great Western Tools, Inc., 3811 Riverside Drive, Burbank, Calif. 88





To obtain additional information on equipment described on this page, see lower part of page 234.

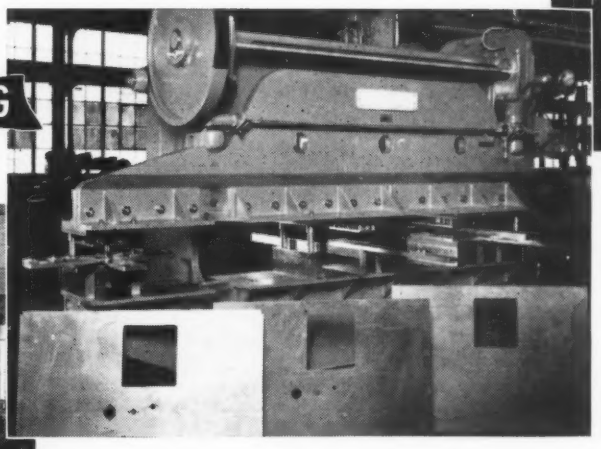


CINCINNATI
50 Series Press Brake

BENDING

MULTIPLE OPERATIONS

USE THIS CINCINNATI FOR ECONOMY...



BLANKING

PUNCHING and PIERCING

For economical handling of the many jobs where greater pressures and larger machines are not required, the Cincinnati 50 Series Press Brakes are outstanding in their performance.

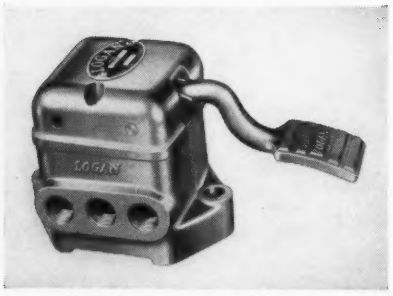
They have all the features of the larger Cincinnati Press Brakes, and offer productivity, accuracy and versatility with low initial investment.

Write for Catalog B-2A, and ask our Engineering Department for details on the many uses of the smaller Cincinnati Press Brakes.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

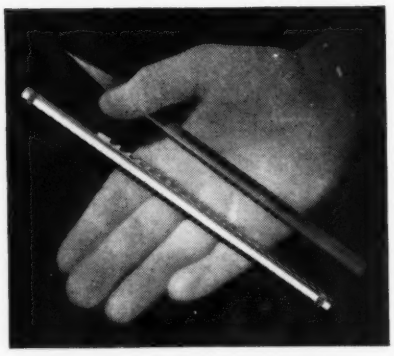


Logan Foot-Operated, Four-Way Air Control Valve

New foot-operated, four-way control valve added to the line of air valves made by the Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind., This Model 6552 valve is built in 3/8, 3/4, and 1 inch port sizes, and is designed for pressures up to 150 pounds per square inch. The self-cleaning construction of this valve keeps the cups free from dirt. All ports and internal air passages are full pipe size, and permit unrestricted air flow, rapid response, and fast operation. 89

Pencil-Size Broach for Small Keyways

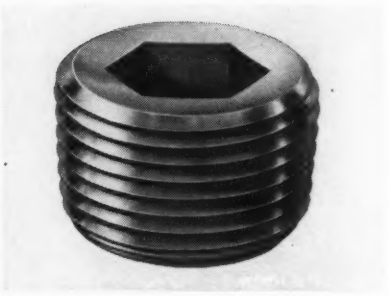
Small pencil-size "Glenny" broach announced by the Kase Machine Co., 18429 Buffalo Ave., Cleveland 19, Ohio. This broach is capable of cutting 1/16-inch wide keyways up to 0.070 inch in depth. The steel cutting blade has a hardness of 63 to 65 Rockwell C, and the tool body and nuts are hardened to 43 to 45 Rockwell C. The new tooth form provides a large chip chamber. End nuts facilitate rapid and infinitely variable adjustment for depth of cut. The cutting blade is moved back and forth in a taper-milled slot by means of the end nuts. Once the end nuts have been hand-tightened, the blade is held firmly in position. These broaches



are available from stock in sizes ranging from 5/16 to 1 1/2 inches in diameter and from 6 7/8 to 11 1/4 inches in length. Blade widths range from 1/16 to 1/2 inch. 90

Allen Hexagon-Socket Pipe Plugs

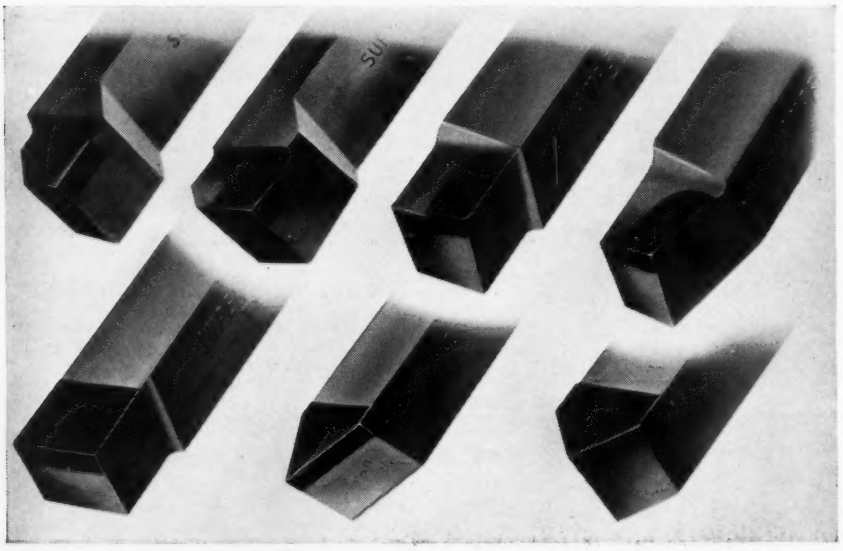
The Allen Mfg. Co., Hartford 1, Conn., has announced two new hexagon-socket pipe plugs designed to eliminate sealing failures. These plugs are entirely pressure-formed and threaded. The heads

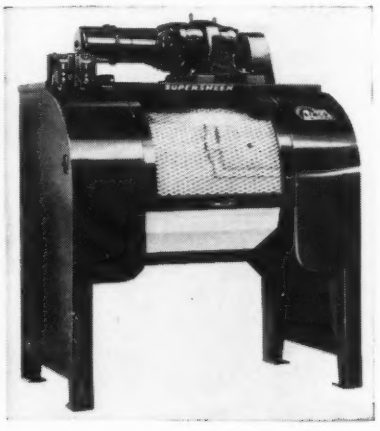


are cold-drawn to obtain the full strength of the metal fibers. The new "Dryseal" pipe plug was designed for use with "Dryseal" taps. It was developed for use where a perfect seal is essential and any sort of sealing compound would be unsafe, particularly where extremely high pressures are involved. The new standard pipe plug is threaded in accordance with Army-Navy Aeronautical Specification AN-P-363. Because of its precise roundness and smooth threads, a sealing compound is not ordinarily needed for pressure-tight joints. These pipe plugs are available in a size range of from 1/16 inch to 1 1/4 inches. 91

Super Tool Co.'s Line of Carbide-Tipped Tools

Seven types of carbide-tipped tools in new line developed for turning, boring, facing, and threading in a wide range of sizes by the Super Tool Co., 21650 Hoover Road, Detroit 13, Mich. This line includes both left- and right-hand styles in side cutting types. All tools are obtainable with optional grades of carbide adapted for cutting steel or various other materials. 92



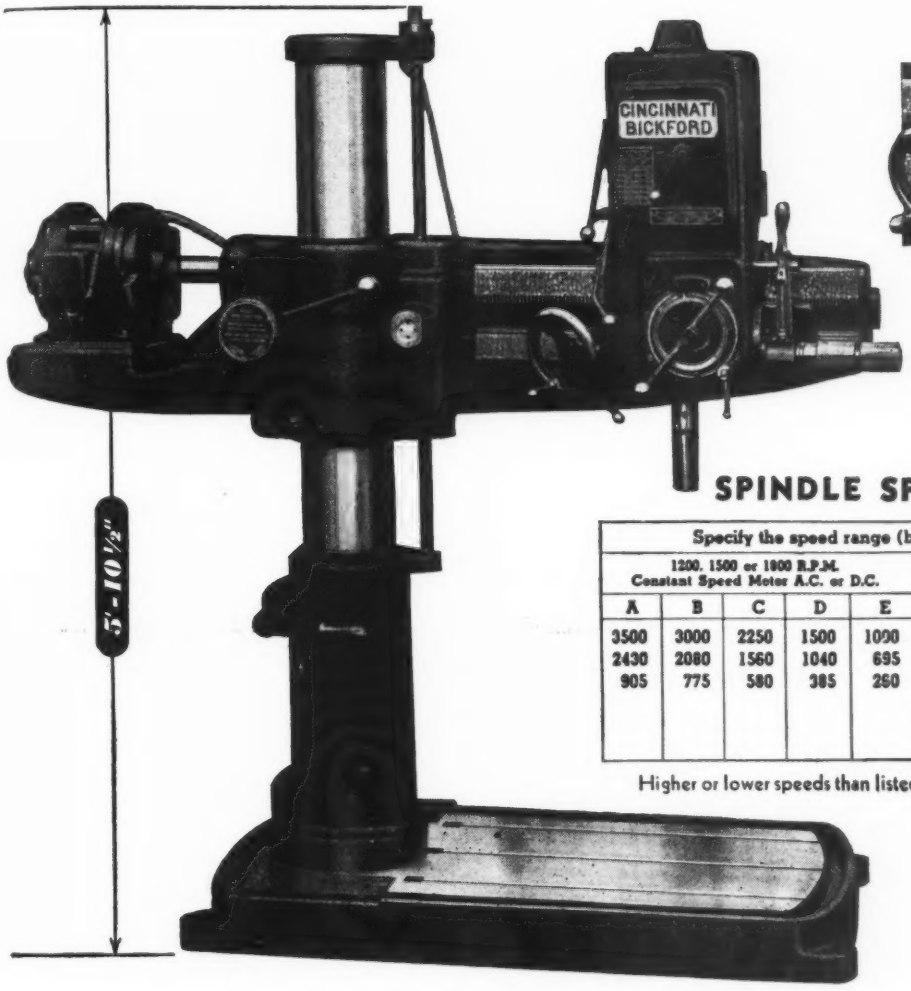


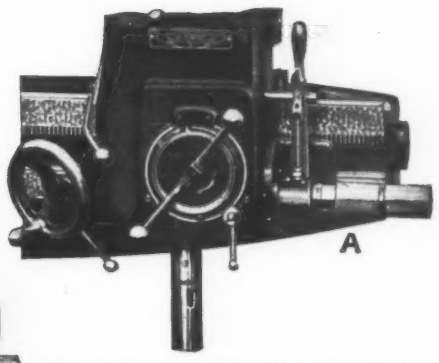
Almco "Supersheen" Deburring and Finishing Barrel

New "Supersheen" deburring and finishing barrel brought out by the Almco Division, Queen Stove Works, Inc., Albert Lea, Minn. The barrel speed of this equipment is variable from 6 to 30 R.P.M., which provides the correct speed for each specific job. Maximum safety is assured by a roll-away perforated hood, which permits positioning of the barrel with the hood down. There are no protruding parts or door handles. Ease of operation is provided by a positive magnetic arrangement that allows inching the barrel into position. Doors are cam-operated for quicker opening and closing. Two safety switches are provided for forward and reverse rotation. This new Model DB-200 is available with neoprene lining or unlined. 93

To obtain additional information on equipment described on this page, see lower part of page 234.

Safe...Simple...Speedy



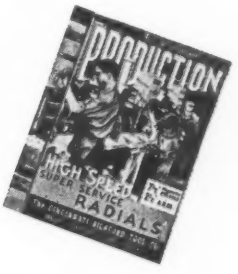


Hand wheel is operated by left hand while right hand (grip A) controls advance and return of spindles and automatically controls direction of spindle rotation.

SPINDLE SPEED RANGES

Specify the speed range (by letter) that meets your needs									
1200, 1500 or 1800 R.P.M. Constant Speed Motor A.C. or D.C.					900/1800 R.P.M. or 750/1500 R.P.M. Two Speed A.C. Motor				
A	B	C	D	E	F	G	H	J	K
3500	3000	2250	1500	1000	3500	3000	2250	1500	1000
2430	2080	1560	1040	695	2430	2080	1560	1040	695
905	775	580	385	260	1750	1500	1125	750	500
					1215	1040	780	520	345
					905	775	580	385	260
					450	385	290	190	130

Higher or lower speeds than listed above are available on special order.



New distinctive features which reduce mass production costs are found in this simplified high-speed Cincinnati Bickford 7½" diameter, 2½' arm Super Service Radial.

You save in power, floor space, and in initial investment. You get a machine, that gives the operator maximum ease and speed in handling.

The machine is sturdy, and will give continuous high production.

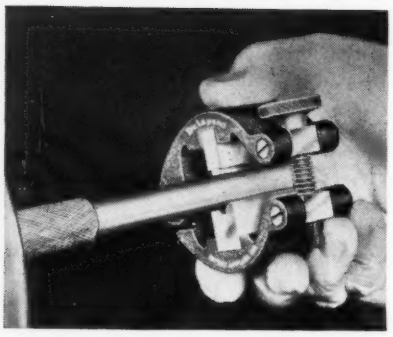
Write for Bulletin R-26A. It is completely illustrated and gives a complete description.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE

Radials 7½' dia. col., 2½' arm, to 26' dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9. Ohio U.S.A.**



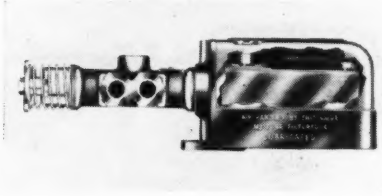
Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13, Ohio, representative for Delapena & Son, Ltd., Cheltenham, England. 94

Delapena External Hone

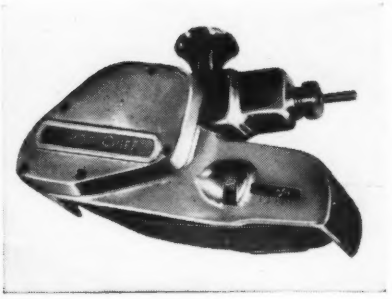
External hone designed for the precision-finishing of external cylindrical surfaces. It will correct out-of-roundness, remove taper, and produce microfinishes. The hone consists of a body member in which a series of guide blocks with stone-holders to suit the diameter of the work can be readily fitted. The body has two hinged parts, held apart by a spring against an adjustable stop or control screw. Roughing, finishing, and polishing stones mounted in holders are supplied for insertion in the hone body. This honing equipment is available for finishing work between 1/16 and 1 inch in diameter, and replacement parts are carried in stock. Sold by the Motch &

Valvair Solenoid-Controlled Air Valve

Solenoid-controlled valve of new line brought out by the Valvair Corporation, 454 Morgan Ave., Akron 11, Ohio, for air pressures ranging from 0 to 125



pounds per square inch. The valves are of the single-solenoid type and are made in 1/4-, 3/8-, and 1/2-inch sizes, for operation on various electric circuits. The valves have one-piece bronze bases with heavy metal covers. They are available in two- and three-way, open-end exhaust (normally closed), and three- and four-way piped exhaust models. 95

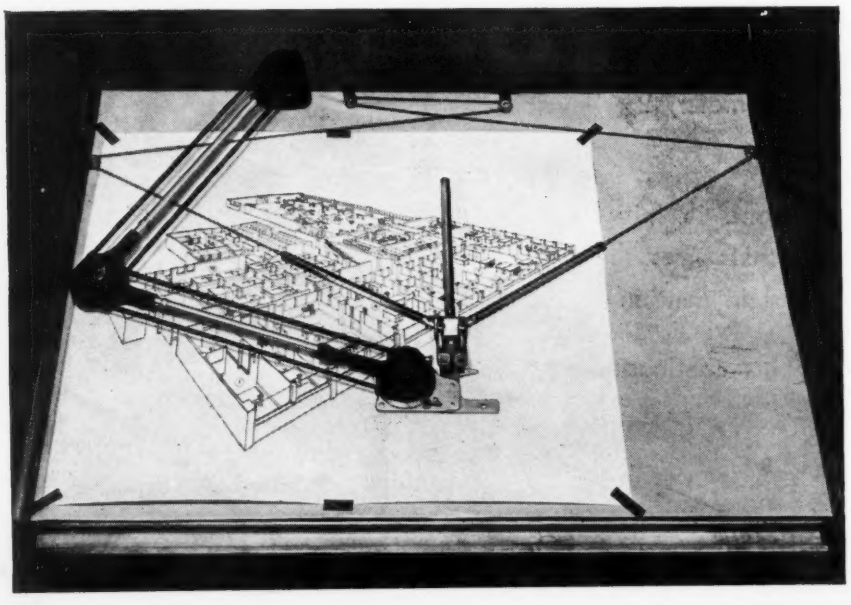


Portable Belt Sanding Attachment

Belt sanding attachment designed for use on any electric drill or flexible-shaft machine. Machined parts are mounted in cast-aluminum housing equipped with phosphor-bronze and self-lubricating bronze Oilite bearings. Built to heavy industrial standards, it weighs approximately 6 pounds, is 8 3/4 inches long, and uses an abrasive belt 2 by 17 1/2 inches. Power is transmitted to the drive roll by heavy cut steel gears, sealed in grease to give a smooth, quiet, positive flow of power for sanding, polishing, and quick paint removal, on wood, plastics, metal, and glass. Manufactured by the United States Industries, Chicago, Ill. National sales agents, George Alpert Co., 401 Broadway, New York 13, N. Y. 97

Perspective and Isometric Drawing Machine

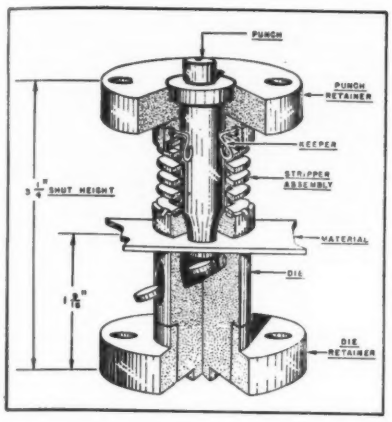
New draftsman's instrument developed to simplify the production of perspective and isometric drawings, announced by the Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill. This new instrument, called the "Perspect-O-Metric," automatically guides the draftsman's pencil toward the established vanishing points from any position on the drawing board when it is used for making perspective drawings. Special scales show instantly the correct reduced dimensions for distant portions of the subject. The instrument can be attached to any standard drafting machine, and is also applicable to parallel-ruling straightedges. The swinging scale arms are held in accurate alignment with the selected vanishing points by a piano wire spring attached to the ends of the scales. The scale arms can be immobilized by tightening a knurled nut, so that the instrument can be used for making isometric drawings. 96



Williams Ratchet Adapter for "Supersocket" Line

Ratchet adapter of compact design recently added to the "Supersocket" line made by J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y. This new adapter makes ratchet action possible in extremely limited spaces. Its use with any of the 1/2-inch square drive handles or attachments, such as "Speeders," T-handles, "Flex" handles, etc., serves to increase the versatility of the driver selected by converting it to a ratchet type tool. The ratchet adapter is made from selected alloy steel and is finished in bright chrome-plate. It is 2 9/16 inches in length, 1 1/4 inches in diameter, has 30 teeth, and is provided with a shift lever for obtaining instant reversal. 98

To obtain additional information on equipment described on this page, see lower part of page 234.

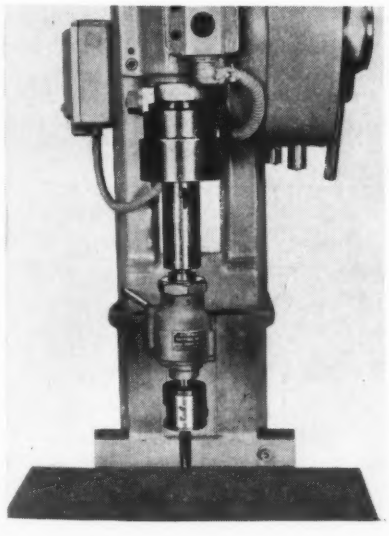


Holemaster Punch and Die Units

Holemaster punch and die unit designed to make it possible to get into production quickly at low die cost on work requiring the piercing or punching of holes that are spaced close together. These small-size units are light in weight and have few parts. All parts are interchangeable, and the units can be used over and over again on the same job or on different jobs. Dies are drilled and tapped to provide for attachment to air lines for automatic slug ejection. The units are available in a wide range of stock hole sizes and shapes. Manufactured by Great Western Tools, Inc., 3811 Riverside Drive, Burbank, Calif. 99

High-Speed Tapping Attachment

High-speed automatic-reverse tapping attachment of full ball-bearing construction introduced by Dorman Machine Tool Works, 38 S. MacQuesten Parkway, Mount Vernon, N. Y. This tapping attachment, shown mounted on a drill press, is 3 1/2 by 5 1/2 by 9 inches, and weighs only 11 pounds. It has a capacity for using hand or machine screw taps in sizes from 3/8 to 7/8 inch in steel, and pipe taps from 1/4 to 1/2 inch. The tapper has a full floating chuck jaw designed to prevent tap breakage due to misalignment of tap and hole. 100



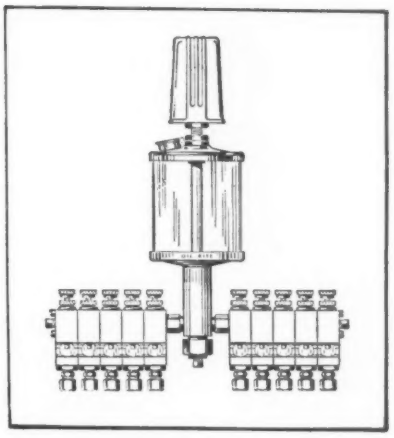
Nelco Stress-Relieved Carbide-Tipped Tools

The Nelco Tool Co., Inc., Manchester, Conn., has just announced a line of stress-relieved carbide-tipped tools that includes the designs illustrated. These tools are of a slash-milled design developed to eliminate brazing strains. Tools of the larger size are brazed, and have a shim of nickel or other material between the brazed surfaces. With this

design, the tip is brazed to one surface only rather than to three surfaces, as in tools of conventional design. This minimizes brazing strains and eliminates grinding cracks. Another feature of these tools is the tip overhang, which permits several regrinding operations to be performed before the wheel cuts into the steel of the holder. The stress-relieved tools are manufactured in all standard grades of carbide, and are available in either milled and brazed or finish-ground condition. 101

Solenoid-Operated Single or Multiple Feed "Electro-Oiler"

Automatic "Electro-Oiler," in which oil is released from the reservoir by a solenoid-operated valve through single or multiple sight-feed valves to the individual bearings requiring lubrication. The solenoid is connected across the line of the motor that drives the machine

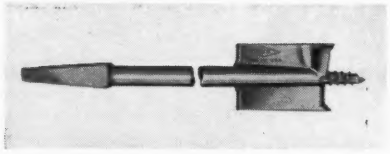


with the bearings to be lubricated. Thus when the motor switch is turned on, lubrication of the bearings starts immediately. A single oil reservoir can be equipped to feed up to twenty-four bearings. The amount of oil fed to each individual bearing can be adjusted. The oiler is adapted for application to machine tools and punch presses. Standard models are available in five body sizes, with capacities ranging from 9 ounces to 1 gallon, for operation on standard voltages. Brought out by the Oil-Rite Corporation, 3490 S. 13th St., Milwaukee 7, Wis. 102

Buckeye Air-Driven Belt Sander

Air-driven belt sander adapted for metal work on all types of concave or convex surfaces, announced by Buckeye Tools Corporation, 21 W. Apple St., Dayton 1, Ohio. This new addition to the Buckeye "Stream-Power" line of portable air tools is applicable to all types of metal finishing on both sheet metal and solid castings made from iron, steel, brass, bronze, solder, aluminum, and magnesium. It is also suitable for finishing and sanding wood products. 103

To obtain additional information on equipment described on this page, see lower part of page 234.

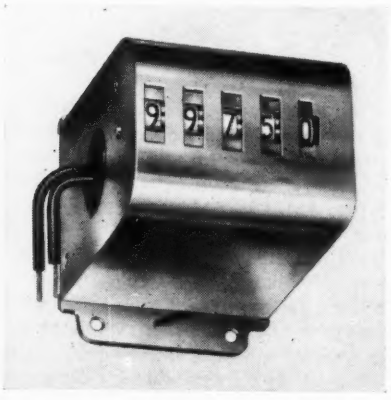


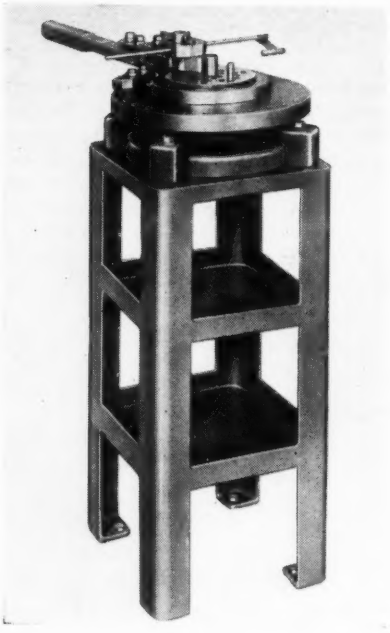
Whitman & Barnes Auger Bit

Auger bit for wood made from drop-forged steel and heat-treated. Designed to drill holes in wood with much less effort than required for drilling with bits of the commonly used types. The construction is such that the bit can be resharpened on a grinding wheel instead of with a special file, as is ordinarily required. Available in six sizes from 3/8 to 1 inch, varying by 1/8 inch. Made by Whitman & Barnes, Detroit 16, Mich. 104

Veeder-Root Non-Reset Magnetic Counter

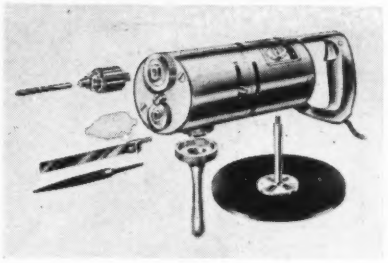
Magnetic counter recently announced by Veeder-Root, Inc., Hartford 2, Conn. This counter is designed to meet the limited specifications of certain types of installations that do not require an extremely high number of accumulated counts or high speeds. It is compactly designed, so that it can be readily built into equipment or machines as an integral part. The five large figures assure easy, direct reading. 105





Floor Cabinet for Di-Acro Bender

Cabinet of welded steel construction brought out by the O'Neil-Irwin Mfg. Co., 332 Eighth Ave., Lake City, Minn., to provide a floor type mounting for the No. 2 and No. 3 Di-Acro benders, which are regularly furnished as bench-mounted machines. The cabinet is 15 by 15 by 34 inches, weighs 90 pounds, and is designed to withstand the pressures developed in bending heavy materials. A No. 2 Di-Acro bender mounted on the stand as shown has a working height of 38 inches. 106



Smilan Tri-Spindle Portable Electric Tool

New multi-purpose, portable electric tool designed for maintenance men, garage and aircraft factory workers, and others. This tool, announced by Smilan Tool Co., 2848 W. Pico Blvd., Los Angeles, Calif., will perform drilling, filing, sanding, polishing, buffing, and other specialized operations. There are three separate spindles. The first provides for 1/4-inch capacity heavy-duty drilling in metal or 1/2-inch capacity in hard wood; the second has a 3/8-inch reciprocating stroke for hacksawing, filing, and key-hole cutting; and the third can be used for right-angle drilling, sanding and buffing with disks, or wire brush applications. This spindle can also be used with a flexible shaft or adapted for circular saws. A 1/4-inch Jacobs chuck is furnished, which can be used interchangeably on all three spindles. The gear-reduction ratio can be increased from 5 to 1 to 10 to 1 by a gear shift, to provide ample torque for heavy-duty use. Spindle speeds of 2000 or 1000 R.P.M. are available. 107

* * *

More than 20,000,000 tons of raw steel have been lost to the nation by strikes since the war. Strikes in this vital industry have cost automobile manufacturers 3,000,000 tons of steel, or enough to build 1,500,000 new cars.

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described in this section is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in June, 1949, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME..... **POSITION OR TITLE**.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

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New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 240 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the June, 1949, Number of MACHINERY

Electric Control Devices

WARD LEONARD ELECTRIC CO., Mount Vernon, N. Y. Catalogue containing 200 pages of technical data on electric control devices, including ratings, specifications, and dimensions. Copies available by writing to the concern at the above address on a company letterhead.

Stainless-Steel Sheets and Plates

EASTERN STAINLESS STEEL CORPORATION, Baltimore 3, Md. Handbook of stainless-steel sheets and plates for the fabricator, containing 127 pages of information on the composition, properties, and application of chrome-nickel sheets and plates, as well as complete data on the processing and fabrication. 1

Electric Control Equipment

RELIANCE ELECTRIC & ENGINEERING CO., 1111 Ivanhoe Road, Cleveland 10, Ohio. Bulletin K-2001, descriptive of the Reliance VSA regulator for electric voltage or current regulation. Bulletin K-2025, on the VSC electronic excitation control for timed-rate acceleration and deceleration in production or processing operations. 2

Lubrication Manual for Plastics Industry

E. F. HOUGHTON & CO., 303 W. Lehigh Ave, Philadelphia, Pa. Manual entitled "Houghton Serves the Plastic Industry," designed to help molding press manufacturers establish correct lubrication practices, and to provide information on the Houghton line of industrial oils, chemicals, and leather packings. 3

Automatic Turret Machines

CLEVELAND AUTOMATIC MACHINE CO., 4932 Beech St., Cincinnati 12, Ohio. Bulletin G-1, describing the Model A single-spindle automatic turret machine built in sizes from 9/16 inch to 9 1/2 inches, and the Model B single-spindle slide machine made in sizes from 1 1/16 to 2 1/2 inches. 4

Nitralloy Steel

JOSEPH T. RYERSON & SON, INC., Box 8000-A, Chicago 80, Ill. Bulletin giving engineering data on Nitralloy, a special alloy steel suitable for use where extremely high wear and abrasion resistance are required. Composition, mechanical properties, and typical applications are included. 5

Corrosion-Resistant Alloys

ELECTRO-ALLOYS DIVISION, AMERICAN BRAKE SHOE CO., Elyria, Ohio. Folder entitled "How to Solve Corrosion Problems with Chemalloy High-Alloy Castings," containing a chart for the quick selection of the most suitable grades of Chemalloy for different corrosive media. 6

Beveled Retaining Rings

WALDES KOHINOOR, INC., TRU-ARC SALES DIVISION, 47-16 Austel Place, Long Island City 1, N. Y. Booklet EDR 1001, containing technical information on the construction and use of Waldes Tru-arc beveled retaining rings, designed to eliminate end play in machine assemblies. 7

Filtering Oils and Coolants

HONAN-CRANE CORPORATION, 912 Sixth St., Lebanon, Ind. Series of four booklets on the value of filtering oils and coolants in metal-working operations. Typical installations of equipment used are described, together with case histories on the savings effected. 8

Burring Tools

PRATT & WHITNEY DIVISION NILES-BEMENT-POND CO., West Hartford 1, Conn. Catalogue containing complete information on the Keller line of burrs and accessories, including details of the new "Di-Bur," designed particularly for use on die steels. 9

Face Mills with Carbide-Tipped Blades

GAIRING TOOL CO., 21225 Hoover Road, Detroit 32, Mich. Bulletin describing the construction of the Gairing E-Con-O-Mill, a face mill with replaceable carbide-tipped blades available in both cone type and heavy-duty models. 10

Punch-Press Pitman

DAYTON ROGERS MFG. CO., Minneapolis 7, Minn. Circular descriptive of the new Dayton Rogers pitman with automatic ram tonnage control, which can be quickly installed on any punch press to provide protection against overload. 11

Chucks

ROCKFORD MAGNETIC PRODUCTS CO., INC., 1302 Eighteenth Ave., Rockford, Ill. Catalogue entitled "Magnetic Holding Methods," containing data on the redesigned Power-Grip Viking chuck and its application in milling, planing, and grinding operations. 12

Hydraulic Standards

MILLER MOTOR CO., 4027 N. Kedzie Ave., Chicago 18, Ill. Booklet containing hydraulic standards

Solid Brass combined with steel and aluminum in this quality lock set

Sargent Pin Tumbler Door Lock, in the 4500 Line of Precision-Built Lock Sets. Includes locking button in center of inside knob, and automatic deadlock. Made by Sargent & Company, New Haven, Conn.

Parts of the Sargent 4500 Line Lock Set. All exposed and most working parts are solid brass. Other metals include seamless steel tube, pressure-cast aluminum, steel springs and lock washers. Steel parts are rust-proofed.

It is a fixed policy of Revere, expressed through its Technical Advisory Service, to recommend the most suitable materials for each application, whether or not supplied by Revere. An outstanding example of this practice is to be seen in the Sargent 4500 line of Precision-Built Lock Sets, a new line of exceptional beauty, security, convenience and long life. Revere and Sargent collaborated closely on this and other Sargent products.

The lock sets have a number of important advantages. One is the self-aligning feature; there is an aligning tube of pressure-cast aluminum which makes it independent of the door for proper functioning. The case is a seamless steel tube, copper brazed to the front support plate. The solid brass lock mechanism has been simplified to achieve a small cross bore, permitting gracefully-designed knobs and roses in the proper proportions. The roses, incidentally, are applied without the usual screws, and there is no set screw in the knob. A new principle permits the knobs to project the same distance on each side, regardless of door thickness. The lock set is available in five different functions, each requiring the same size holes in the door, for the economy of standardized installation.

All exposed parts are brass as are many of the other parts—solid brass, the quality metal that assures permanent service and good looks in hardware. Revere is proud to be an important supplier of fine brass in the hardware industry, as well as to manufacturers generally . . . The Technical Advisory Service is always at your service, ready to give unbiased suggestions on materials, design and fabrication.

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Sales Offices in Principal Cities, Distributors Everywhere.

for industrial equipment compiled and approved by the Joint Industry Conference sponsored by automotive and industrial manufacturers. 13

Pressed-Powder Parts

NEW JERSEY ZINC CO., 160 Front St., New York 7, N. Y. New quarterly publication entitled "Metal Powder Press" devoted to case histories of non-ferrous pressed-powder parts. Copies are available to executives, designers, and engineers. 14

Hole Punching and Notching Units

WALES-STRIPPIT CORPORATION, 345 Payne Ave., North Tonawanda, N. Y. Catalogue CJ, illustrating and describing Wales hole-punching units for punching mild steel up to 1/4 inch thick, as well as Wales notching units. 15

Ductility Testing Machines

TINIUS OLSEN TESTING MACHINE CO., 1052 Easton Road, Willow Grove, Pa. Bulletin covering the complete Olsen line of ductility testing equipment, together with instructions on installation, maintenance, and operation. 16

Magnetic Motor Control

TRUMBULL ELECTRIC MFG. CO., Plainville, Conn. Bulletin TEB 8, on the company's new Type GM line of magnetic motor control that provides protection against damage from overload and undervoltage to alternating-current motors up to 50 H.P. 17

Metal Stampings

CITY AUTO STAMPING CO., Toledo, Ohio. Booklet entitled "Metal Stampings—The Strong Right Arm of America's Durable-Goods Industries," illustrating the company's facilities for producing metal stampings. 18

Speed-Changers

ALLIS-CHALMERS MFG. CO., S. 70th St., Milwaukee 1, Wis. Bulletin 20B6013-C containing information on advantages, applications, speed range, recommended unit sizes, and dimensions of Vari-Pitch speed-changers. 19

Compressed-Air Separators

JAMES A. MURPHY & CO., Fifth and Vine Sts., Hamilton, Ohio. Bulletin P, containing information on the Paragon C separators for removing dirt, oil, and moisture from compressed air at the point of use. 20

Beryllium-Copper Investment Casting

BERYLLIUM CORPORATION, Reading, Pa. Bulletin 11, containing complete data on the use and cost-saving possibilities of beryllium-copper investment casting for the production of small precision parts for industrial use. 21

Welding Non-Ferrous Metals and Cast Iron

LINCOLN ELECTRIC CO., Cleveland 1, Ohio. Bulletins 464 and 465 describing electrodes and procedures for welding aluminum, bronze, brass, copper, and cast iron. 22

Precision Measuring Tools

TUBULAR MICROMETER CO., St. James, Minn. Catalogue 20, containing data on the Tumico line of precision measuring instruments, including tubular micrometers, snap gages, dial indicator gages, calipers, etc. 23

Hydraulic Presses

BALDWIN LOCOMOTIVE WORKS, Philadelphia 42, Pa. Bulletin 285, illustrating and describing a wide variety of hydraulic presses for forming, drawing, forging, extruding, straightening, and many other operations. 24

Nickel Alloys for Electronic Uses

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York 5, N. Y. Booklet describing the electrical and electronic properties of eighteen high-nickel alloys, and their applications. 25

Motorized Speed Reducers

D. O. JAMES GEAR MFG. CO., 1140 W. Monroe St., Chicago 7, Ill. New price list and selection table for the company's line of motorized gear speed reducers, to be used in conjunction with Catalogue 1000. 26

Pack-Hardening and Isolating Pastes

DENFIS CHEMICAL LABORATORIES, INC., 172 Pacific St., Brooklyn 2, N. Y. Bulletin on "Carburit," a new pack-hardening paste, and "Isopac," an isolating paste. 27

Synchronous Motors

ALLIS-CHALMERS MFG. CO., 1009 S. 70th St., Milwaukee, Wis. Bulletin 05B6112A, describing the construction features of Allis-Chalmers bracket-bearing synchronous motors, which range from 30 to 1000 H.P. 28

Portable Electric Saws

CHICAGO PNEUMATIC TOOL CO., 8 E. 44th St., New York 17, N. Y. Bulletin SP-3000, describing the new "Hi-Speed" portable electric circular saws, available in three sizes, for use on metal, wood, and other materials. 29

Tungsten-Carbide Tools

WILLEY'S CARBIDE TOOL CO., 1340 W. Vernor Highway, Detroit 1, Mich. Catalogue 449, covering the company's complete line of tungsten-carbide tools, as well as diamond tools and mechanical dressers. 30

Immersion Heating Equipment

SURFACE COMBUSTION CORPORATION, Toledo 1, Ohio. Bulletin SC-142, illustrating and describing gas-fired tubular immersion heating equipment and typical industrial applications. 31

Tapping Compound

CINCINNATI MILLING MACHINE CO., CIMCOOL DIVISION, Cincinnati 9, Ohio. Folder briefly describing the properties and advantages of Cimcool tapping compound, an extreme pressure lubricant. 32

Gas Welding Supplies

AIR REDUCTION SALES CO., 60 E. 42nd St., New York 17, N. Y. Catalogue on gas welding supplies, presenting data on welding rods, fluxes, silver brazing alloys, and carbon rods and plates. 33

Radial Saws

WALKER-TURNER DIVISION, KEARNEY & TRECKER CORPORATION, Plainfield, N. J. Folder 1009, covering the Walker-Turner new 900 series radial saws for wood, plastics, and metal. 34

Gas-Burner Safeguard

COMBUSTION CONTROL CORPORATION, 77 Broadway, Cambridge 42, Mass. Bulletin CG 4752, describing the "Fireye" flame-failure safeguard for industrial gas oven, kiln, and boiler protection. 35

Hydraulic Fluid for Die-Casting

MONSANTO CHEMICAL CO., St. Louis 4, Mo. Bulletin descriptive of Aroclor 1248, a non-flammable, non-corrosive hydraulic fluid for metal die-casting systems. 36

Electrodes

EUTECTIC WELDING ALLOYS CORPORATION, 40 Worth St., New York 13, N. Y. Folder describing the "Eutectrode," an electrode designed for arc-welding all types of alloy steel. 37

Air and Hydraulic Cylinders

ORTMAN-MILLER MACHINE CO., INC., 1222 150th St., Hammond, Ind. Catalogue giving dimensions of the company's line of cylinders operated by air, water, or hydraulic power. 38

Wrenches and Shop Tools

BILLINGS & SPENCER CO., Hartford, Conn. Catalogue 49, containing 100 pages of information on the company's line of wrenches and shop tools, conveniently indexed. 39

Hydraulic Shop Presses

RODGERS HYDRAULIC, INC., St. Louis Park, Minneapolis, Minn. Catalogue 313, covering the company's line of hydraulic shop presses ranging from 60 to 400 tons. 40

Hydraulic Oils

SWAN-FINCH OIL CORPORATION, R.C.A. Bldg., West, New York 20, N. Y. Folder on the new "Saf-Drive" processed hydraulic oils. 41

Stainless Cutting Oil

GULF OIL CORPORATION, Pittsburgh, Pa. Leaflet describing the application and advantages of Gulf stainless cutting oil on automatics and other machines. 42

Tapping Machines

ETTCO TOOL CO., INC., 594 Johnson Ave., Brooklyn 6, N. Y. Bulletin describing the No. 72 Ettco-Emrick foot-operated tapping machine. 43

Arc-Welders

HOBART BROTHERS CO., Box EW-136, Troy, Ohio. Catalogue containing specifications of the company's complete line of "Simplified" arc-welders. 44

Micro Hardness Tester

KENT CLIFF LABORATORIES, Peekskill, N. Y. Bulletin K-49, describing the construction features of the newly developed Kentron micro hardness tester. 45

Automatic Safety Valve

OLIN GAS ENGINE CO., 9-11 Lafayette Ave., Buffalo 13, N. Y. Leaflet describing the Olin automatic shut-off valve for use on compressed air lines. 46

Motor Control Unit

SERVO-TEK PRODUCTS CO., 4 Godwin Ave., Paterson 1, N. J. Catalogue describing and illustrating the company's new electronic motor control unit. 47

Preformed Wire Rope

MACWHYTE CO., 2940 Fourteenth Ave., Kenosha, Wis. Folder containing questions commonly asked about preformed wire rope and their answers. 48

Elevators and Cranes

BARRETT-CRAVENS CO., 4609 S. Western Blvd., Chicago 9, Ill. Bulletin 10482, containing 36 pages covering the complete line of elevators and portable cranes made by this company. 49

Plug Gages

STANDARD GAGE CO., INC., Poughkeepsie, N. Y. Circular on use and advantages of "DuBo" plug gages, including tables of gagemakers' tolerances. 50

Hydraulic Valves

GEROTOR MAY CORPORATION, Baltimore 3, Md. Catalogue Section 201, describing over ninety different models of Gerotor four-way hydraulic valves. 51

Velocity Limiting Air Valves

PNEU-TROL DEVICES, INC., 3122 N. California Ave., Chicago 18, Ill. Leaflet describing the Pneu-Trol automatic velocity limiting valve for air systems. 52

Cut-Off Machines

BUEHLER LTD., 165 W. Wacker Drive, Chicago 1, Ill. Leaflet descriptive of AB cut-off machines designed for use in the metallurgical laboratory. 53

Grinder-Millers

PRECISE PRODUCTS CO., 1328-30 Clark St., Racine, Wis. Leaflet descriptive of the Precise Super 40 grinder-miller. 54

To Obtain Copies of New Trade Literature

listed in this section (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue (June, 1949) to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

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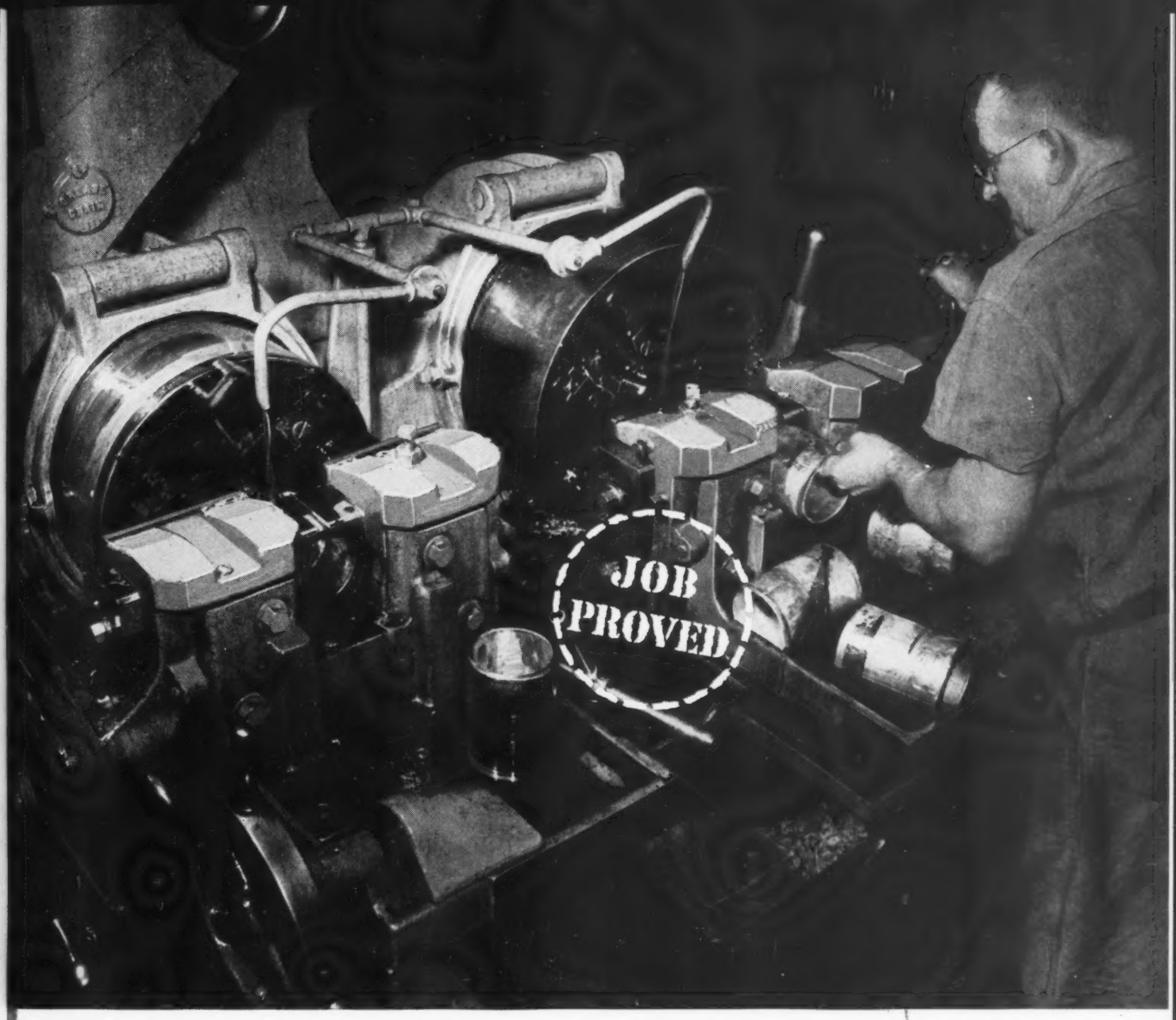

CHASER LIFE INCREASED 50%

Sun Cutting Oil Improves Quality of Threads, Steps-up Pipe Nipple Production

Operation: Threading 4" pipe nipples

Machine: Landis Threading Machine

Material: 4" galvanized welded steel tubing SAE 1025-1040

Speed: Threading 1½" on each end of about 300 pieces per 8-hr. day

Chaser Life: 3 days before resharpening

Cutting Fluid: Sun Cutting Oil 31W

A manufacturer threading pipe nipples was not getting satisfactory finished threads with the cutting fluid in use. Chaser life was abnormally short, resulting in excessive downtime and high percentage of rejects, with consequent loss of production.

Changing to Sun Cutting Oil 31W, this shop increased chaser life 50 percent, and reports that "the threads are the best we ever made." With rejects practically eliminated and downtime for changing chasers reduced to the absolute minimum, production has greatly increased.

Sun Cutting Oil 31W is a dark, free-flowing, sulphurized oil. It is recommended for heavy duty jobs where an emulsified cutting oil is not suitable. For further information about Sun Cutting Oils or other "Job Proved" Products for the metalworking industry, call or write the nearest Sun Office. The services of a Sun Engineer are available without obligation.

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

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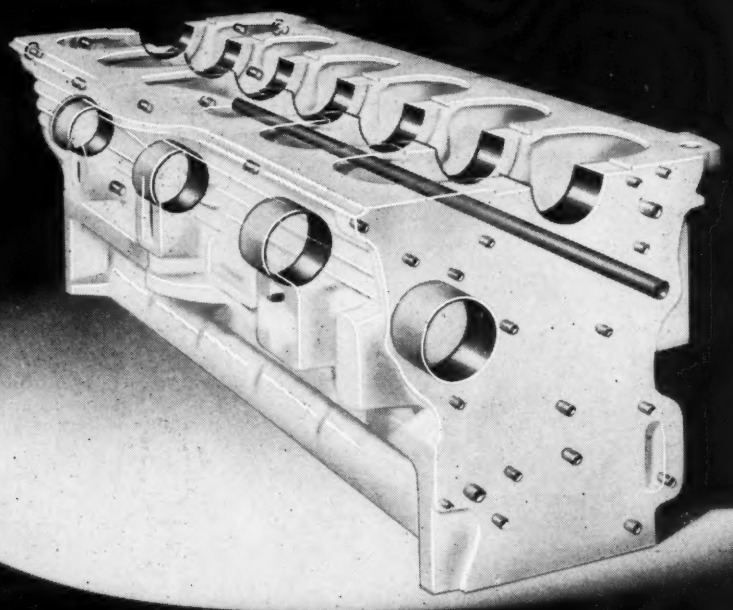
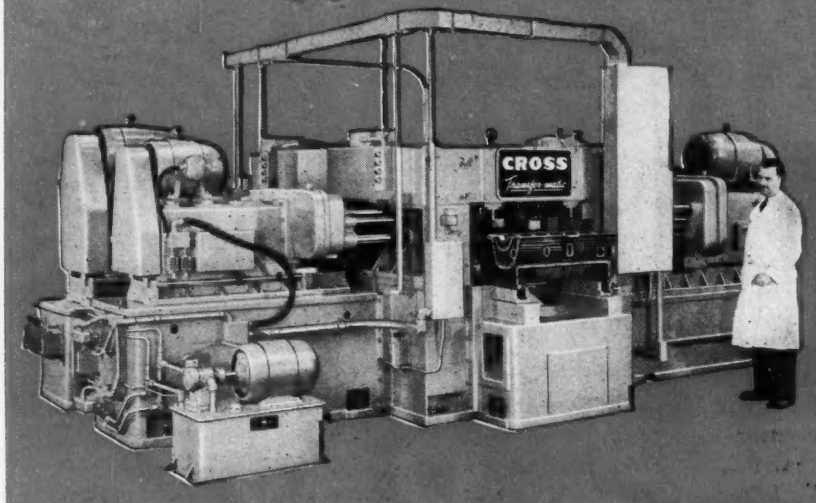


BORES, DRILLS, REAMS

Cylinder Blocks



★ Rough bores seven crankshaft and four camshaft bearings, drills oil gallery hole complete, drills 21 holes in front face, drills 10 holes in rear face, and rough reams two locating holes in rear face. Production requirement, 35 hourly at 100%.

★ Transfer mechanism carries parts from station to station, power elevator positions parts, and individual clamps secure parts at each station.

★ Seven stations include loading station, five working stations and intermediate inspection station.

Established 1898

THE **CROSS** CO.

DETROIT 7, MICHIGAN

SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

By E.S.S.

BETWEEN GRINDS

June — Five Decades Ago

Then and Now is always revealing, and so we were not too surprised upon dusting off June, 1899, MACHINERY to note a somewhat different decor of the Infanta Machina. Victorian pomp and circumstance perhaps accounted for the tone of the leading article, which was a report of the Washington meeting of the American Society of Mechanical Engineers, attended by 568 good people. We quote: "The spring meetings are always enjoyable occasions from a social standpoint... The most notable gathering was the reception given to the engineers by Mr. and Mrs. George Westinghouse, at their spacious home, which was formerly the James G. Blaine mansion. The palatial residence, although of unusual size, was not large enough and an annex was built, 40 by 50 feet, to serve as a supper room. This room was a veritable fairyland; the walls were hung with white silk and festooned with satin ribbon and the superb floral decorations were of orchids and roses arranged in exquisite taste and lighted by myriads of tiny incandescent lamps." (Could this be a plug?) The article finally got down to technical matters, including a discussion in which the president of the Society said that his department had experienced more trouble during the Spanish war from leaky pipe joints than from any other single cause. (Always bottlenecks.)

Calling All Small Shops

Beginning with this issue, MACHINERY is publishing a series of articles on determining machining costs in job shops. Here is what the Editor had to say to our subscription men about the series: "Successful operation of small and medium-sized machine shops generally depends upon a satisfactory method of determining the cost of machining individual workpieces. If the price quoted for a job is too high, the customer will give another shop the job; and if too low, money will be lost on the job. Shops require an accurate method of predicting machine time. We feel that this series of articles will supply such a method."

Opus Out in Technical Society Makes the One Hundred

Every year the Science and Technology Division of the New York Public Library selects the hundred best technical books of the year. Modestly, we agreed with Reginald Hawkins, chief of the Division, when he chose "Mathematics at Work," an Industrial Press book, as one of them, with the comment "A notable addition to the long shelf of books of this kind" ("The Library Journal," May 15). For we have watched the rising curve of sales on a graph plotted by the book's author and associate editor of MACHINERY, Holbrook L. Horton. And how else would a man of math determine his book's popularity?

Adjustable Names

Precise Products Co. of Racine, Wis., end their letters "Precisely yours." Such a concern as E. W. Bliss could use "Blissfully yours" for the complimentary close, but we doubt if a boring tool company would care for "Boringly yours."

The M.C. in Industry—Management Consultant HERBERT W. BROWN is author of a series of articles beginning with this issue (page 159). Mr. Brown enjoyed a blended education, studying mechanical engineering at the Lewis Institute of Technology and accountancy and commercial law at Pace. This happy fusion resulted in a career as both industrial engineer and management consultant. He started as a production and methods engineer with the Teletype Corporation of Chicago, later free-lancing in both the United States and Canada. During the recent war, he was an industrial specialist in the Machine Tools Division of the W.P.B. From 1945 to 1948, he worked with the Dana Corporation of Toledo and its subsidiaries on production and reorganization problems. At present living in Salamanca, N. Y., Mr. Brown is applying himself to the design and construction of special-purpose hydraulic molding presses in the plastic industry. He devotes his spare time to family outings, which is most understandable when one possesses three active sons. Dollars to doughnuts, he handles provender for picnics as diligently as he does figures for job shops.

News of the Industry

California

ARO EQUIPMENT CORPORATION, Bryan, Ohio, manufacturer of pneumatic tools and lubricating equipment, announces the appointment of ARO SALES & SERVICE, INC., a newly formed California corporation, as distributor of Aro products on the Pacific Coast, with headquarters at 2023 S. Grand Ave., Los Angeles 7, Calif. An office will also be maintained at 766 Brannan St., San Francisco. The officers of the new company are J. E. ALLEN, president; W. D. EDWARDS, vice-president; and L. W. LISLE, secretary and treasurer. Sales and service for the Pacific Northwest will be handled by the PRATTO SALES CO., 714 Fourth Ave., Seattle, Wash.

REVERE COPPER & BRASS, INC., New York City, recently opened a plant at 6500 E. Slauson Ave., Los Angeles, Calif., covering over thirteen acres. CHARLES J. PAUMIER is works manager of the new plant, and WALLACE H. HITCHCOCK is manager of the Pacific Coast Division.

SYNCRO MACHINE CO., 611 Sayre Ave., Perth Amboy, N. J., manufacturer of machinery for the wire industry, has appointed JACK P. WILLIAMS, JR., representative in the state of California. He will be located in the Matson Bldg., 215 Market St., San Francisco.

GEORGE A. SPENCER has been appointed head of the Los Angeles sales office of the American Nickeloid Co., located at 1323 Venice Blvd., Los Angeles 6, Calif.

Illinois, Indiana, and Missouri

LINK-BELT CO., Chicago, Ill., announces the following promotions: ALLAN CRAIG, sales manager of the company's southeastern division, with headquarters in Atlanta, Ga., is being transferred to Houston, Tex., in the capacity of general manager of the southwestern division, where a new Link-Belt plant is about to be opened; MICHAEL J. PERRY, district manager at Moline, Ill., will succeed Mr. Craig at Atlanta; and ANDREW K. KOLAR, district sales engineer, has been appointed district manager in charge of the Moline office.

WILLIAM BAUMBECK, general superintendent of the Rock Island Arsenal, Rock Island, Ill., recently retired from active duty after completing about forty-five years of service with the Ordnance Department. He is a recognized authority on machine tools and industrial equipment, and throughout his career has contributed many articles to the technical press on improved methods of manufacture.

ALLEN R. BINCKES has been appointed district sales manager in the Pacific Coast area for the Whiting Corporation, Harvey, Ill., with headquarters at 5649 Alhambra Ave., Los Angeles, Calif. HAROLD OVERMAN has been made assistant to Mr. Binckes. Mr. Binckes was formerly sales engineer at the New York district office, 30 Church St. The position made vacant by his new appointment will be filled by HARRISON TAYLOR.

A. W. ANDERSON has retired as vice-president of the Claud S. Gordon Co., Chicago, Ill., on account of ill health, after thirty-one years of association with the company.

HYDRO-LINE MFG. CO., Rockford, Ill., has appointed the following representatives for the Hydro-Line air and hydraulic cylinders and special machinery: LEASER ENGINEERING CO., LaPorte, Ind.; and EUCLID MACHINE & SALES CO., 1836 Euclid Ave., Cleveland, Ohio.

TORRINGTON CO., Torrington, Conn., announces that its Chicago office has been moved to a new location at 4352 W. Roosevelt Road, Chicago 24, Ill. It was formerly at 176 W. Adams St.

J. F. ROCHE, president of the Binks Mfg. Co., Chicago, Ill., has been elected chairman of the board, and is succeeded in the presidency by his son, Burke B. Roche.

BLACK & DECKER MFG. CO., manufacturer of portable electric tools, Towson, Md., announces that its Indianapolis service station has been moved to a new building located at 1125 W. 16th St. This service station has a showroom, where a large range of the company's tools are displayed. J. T. REDMON, service engineer, and M. D. MOOERS, sales engineer, will be in charge of this branch.

B. C. AMES CO., Waltham, Mass., has appointed W. E. FRY & CO., 909 Wyandotte St., Kansas City 6, Mo., as exclusive representative in the states of Kansas, Nebraska, and Missouri, for the Ames line of micrometer dial gages and indicators.

Michigan

ALLIED PRODUCTS CORPORATION, Detroit, Mich., is erecting a new plant at 12677 Burt Road in Detroit for the Victor-Peninsular Division of the corporation, which manufactures special cold-forged parts and high-carbon hexagon-head cap-screws. The new buildings will contain approximately 125,000 square feet, about 16,000 square feet of which will be utilized for the general offices and the remainder for manufacturing space. The manufacturing facilities are expected to be available in July.

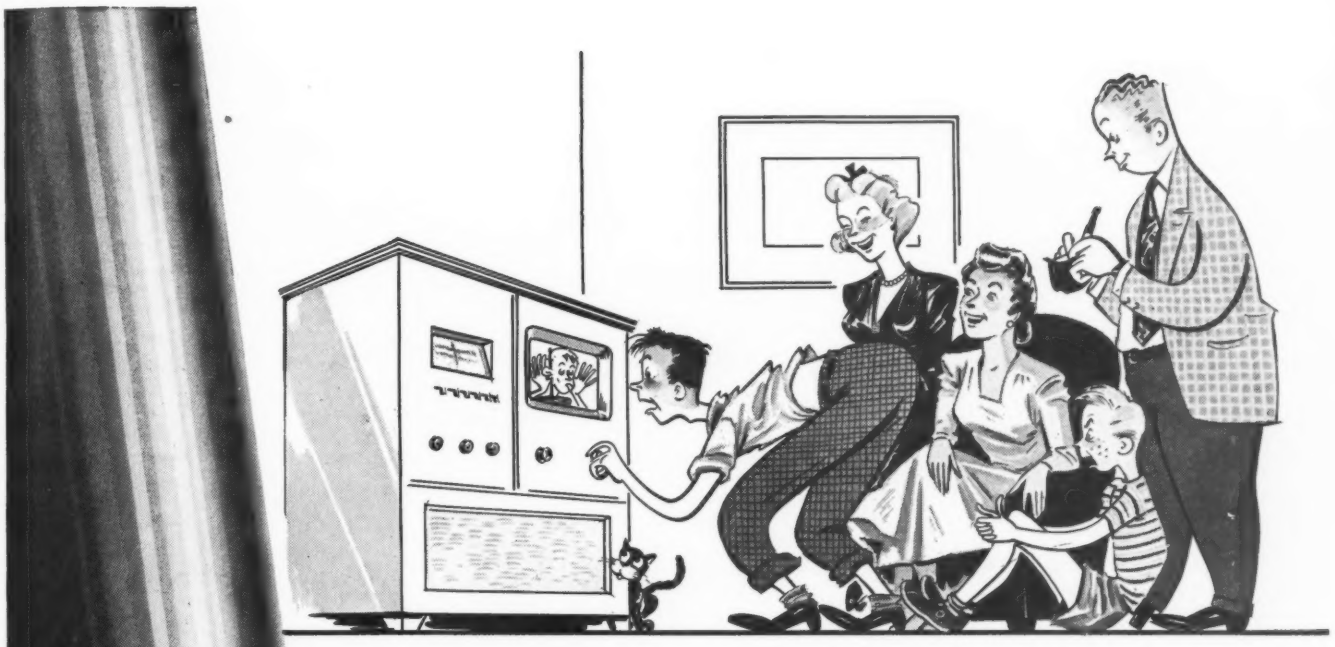
CHICAGO-LATROBE, manufacturer of twist drills, reamers, and special tools, recently announced the opening of a factory branch and warehouse at 111 E. Milwaukee St., Detroit, Mich. WILLIAM B. CRUMP has been appointed district manager, with headquarters at the new branch. JOSEPH A. WOLFE will also serve as district representative at this branch.

CLAYTON E. SCHOLES has been appointed general manager of the Ohio Stainless & Commercial Steel Co.'s new Osco Steel Division, located at 6970 W. Jefferson Ave., Detroit, Mich. NATE A. WADE has been appointed assistant manager, and OWEN W. BROCK warehouse manager. This division of the Cleveland company will handle carbon and alloy steel bars, steel sheets, and copper and brass products.

HENRY T. SCHLACHTER has been appointed Detroit representative of the Detroit Broach Co., to replace EARL HOVEY, who is retiring from the cutting tool field. BOB STRANGE will be associated with Mr. Schlachter at the Detroit office, 20201 Sherwood Ave., Detroit 12, Mich. Mr. Schlachter was formerly at the Cincinnati office.

GORHAM TOOL CO., Detroit, Mich., has appointed the following distributors: BENSON & CHURCH CO., 1060 Broad St., Newark, N. J.; COOPER TOOL & ENGINEERING CO., 3990 Alabama Ave., St. Louis Park, Minneapolis 16, Minn.; and W. E. FRY & CO., 909 Wyandotte, Kansas City 6, Mo.

DETROIT DIE SET CORPORATION, Detroit, Mich., has appointed the following sales representatives: NELSON R. CHURCH, Pawtucket, R. I.; E. M. BENSON, Meriden, Conn.; and C. W. KEENY, of the Benson & Church Co., 1060 Broad St., Newark, N. J.



FOR A SHARPER IMAGE OF

TOP PROFITS IN TELEVISION PRODUCTION and SALES

. . . set-builders use

AMERICAN PHILLIPS SCREWS

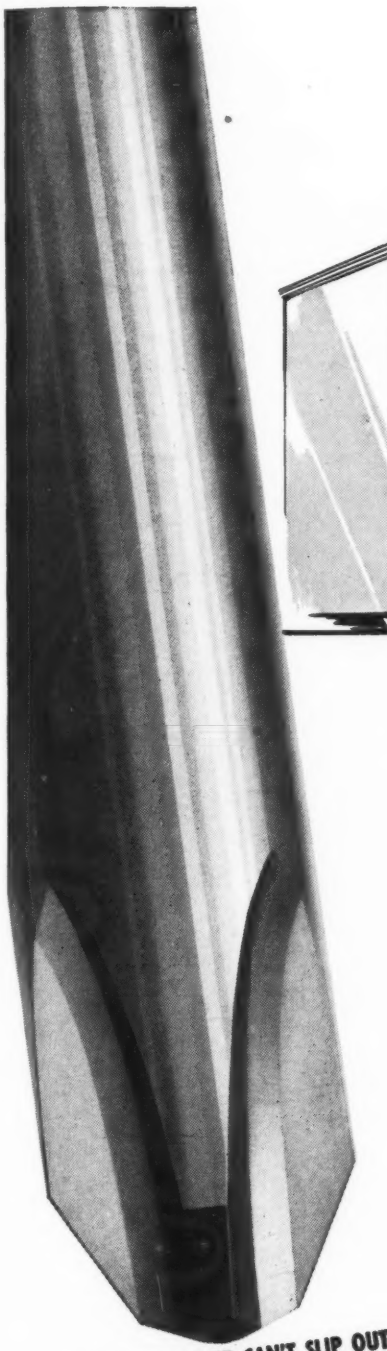
SEE NEW PRODUCTION PROFITS: Assembly of costly television sets puts a prohibition on spoilage. That's why American Phillips Screws are used, to help keep sets rolling out to an eager market, and to keep rejections down. No delays or losses, then, and output hits the main channel with highest return per man-hour, *which means time-savings up to 50%!*

SEE NEW SALES-STIMULATION: Smoothly finished, unmarred cabinet work is the basis of television-set sales. And that's the way sets come from an assembly department using *American Phillips Screws.*

Does YOUR product have this double-feature of production-economy and sales promotion? Then write:

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Building



4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

J. H. Broderick, recently appointed field sales manager for Geometric Tool Co.

New England

J. H. BRODERICK has been appointed field sales manager for the Geometric Tool Co., New Haven, Conn., a division of the Greenfield Tap & Die Corporation. Mr. Broderick has been chief inspector of the Geometric Tool Co. since 1935.

GENERAL ELECTRIC CO., Pittsfield, Mass., announces the sale of the company's cold molded plastics business at Meriden, Conn., to the GARFIELD MFG. CO., of Garfield, N. J. This is the final phase in the closing of the Connecticut plastics plant.

NORTON CO., Worcester, Mass., announces that it has reorganized its sales areas and established a new region in the central United States which will include territories around Cleveland and Detroit. DONALD L. PRICE, Detroit district manager for the company's abrasive division since 1944, has been appointed sales manager of the new region. WILLIAM A. RUSSELL, abrasive engineer in Toledo, will succeed Mr. Price as district manager at Detroit.

RALPH M. JOHNSON, vice-president in charge of sales of the Norton Co., Worcester, Mass., has been elected second vice-president of the American Supply and Machinery Manufacturers' Association.

VICTOR LADETTO has been appointed sales manager and DONALD H. SLEEPER assistant sales manager of the Continental Screw Co., New Bedford, Mass.

JAMES G. GUNDERSON has been appointed sales engineer for the New England territory by the Federal Products Corporation, Providence, R. I., manufacturer of precision measuring instruments. Mr. Gunderson, who has been purchasing agent for the last thirteen years, will be succeeded in that position by HARLAN E. GILSON, JR., assistant purchasing agent.

New Jersey

JOHN D. RILEY has been appointed district manager at Newark, N. J., for the Link-Belt Co., Chicago, Ill., to succeed George E. Ramsden, who died recently. Since 1939 Mr. Riley had been district sales engineer at the company's Boston office. The Newark office has recently been moved to larger quarters at 212 Essex Bldg., 31 Clinton St. (Zone 2).

SYNCRO MACHINE CO., 611 Sayre Ave., Perth Amboy, N. J., manufacturer of machinery for the wire industry, announces the acquisition of sales and manufacturing rights to the continuous electric strand annealer developed by the COOK ENGINEERING CO., of Paterson, N. J.

TINNERMAN PRODUCTS, INC., Cleveland, Ohio, manufacturer of "Speed Nut" fasteners, has moved its New York district office from 620 Lexington Ave., New York City, to new and larger quarters at 75 Roseville Ave., Newark, N. J.

HUGO W. JONES has been appointed assistant sales manager of the Adamas Carbide Corporation, 1000 S. Fourth St., Harrison, N. J. For the last ten years, Mr. Jones has been associated with the Tungsten Electric Corporation.

JOHN A. HANSON TOOL CO. announces its removal from 165 Grove St., Bloomfield, N. J., to larger quarters at 143-145 Heckel St., Belleville, N. J.

New York

CARBORUNDUM CO., Niagara Falls, N. Y., announces the following changes in district sales office personnel: R. P. COLOSI, office manager of the Buffalo district sales office, has been transferred to Cleveland to succeed H. P. ERBE, who is now office manager at Pittsburgh. H. E. MORRILL, supervisor, branch inventories, has been promoted to the position of office manager of the Chicago district sales office to succeed R. J. NEMEC, who now heads the St. Louis district sales office. A. L. FISCHER, formerly office manager at St. Louis, has been assigned other important duties in connection with that office.

ARTHUR B. GOETZE has been appointed works manager of the Western Electric Co.'s Tonawanda plant in Buffalo, N. Y., the 42nd St. shops in New York City, and the Allentown plant in Allentown, Pa. He was previously acting works manager of these plants, and replaces WILLIAM K. WIGGINS, who has retired. Headquarters of the company are at 195 Broadway, New York 7, N. Y.

MAGNESIUM ASSOCIATION, 30 Rockefeller Plaza, New York City, announces the appointment of the following officers for 1949-1950: President, A. W. WINSTON, Dow Chemical Co.; vice-president, H. B. MEGILL, Dominion Magnesium Ltd., Canada; and treasurer, R. D. FERGUSON, Bendix Aviation Corporation, Eclipse-Pioneer Division.

RALPH J. CORDINER was elected executive vice-president and a director of the General Electric Co., Schenectady, N. Y., at a recent meeting of the board of directors. Since 1945, Mr. Cordiner has been vice-president and assistant to the president.

ATLANTIC GEAR WORKS, INC., 200 Lafayette St., New York City, has been appointed exclusive distributor in the states of New York, Connecticut, and New Jersey for the stock gears manufactured by the Ohio Gear Co., Cleveland, Ohio.

WARD LEONARD ELECTRIC CO., Mount Vernon, N. Y., announces that its general office has been moved from the factory building at 31 South St. to a new office building, 115 South MacQuesten Parkway, Mount Vernon.

JAMES R. SHEPARD has been appointed western district works manager and THOMAS J. WOOD eastern district works manager of the Brake Shoe & Castings Division of the American Brake Shoe Co., New York City.

ALEX M. SNEDDON, 164-23 Ninety-ninth St., Howard Beach 14, N. Y., has been appointed representative for the sale of the hydraulic press equipment made by the Denison Engineering Co., Columbus, Ohio.

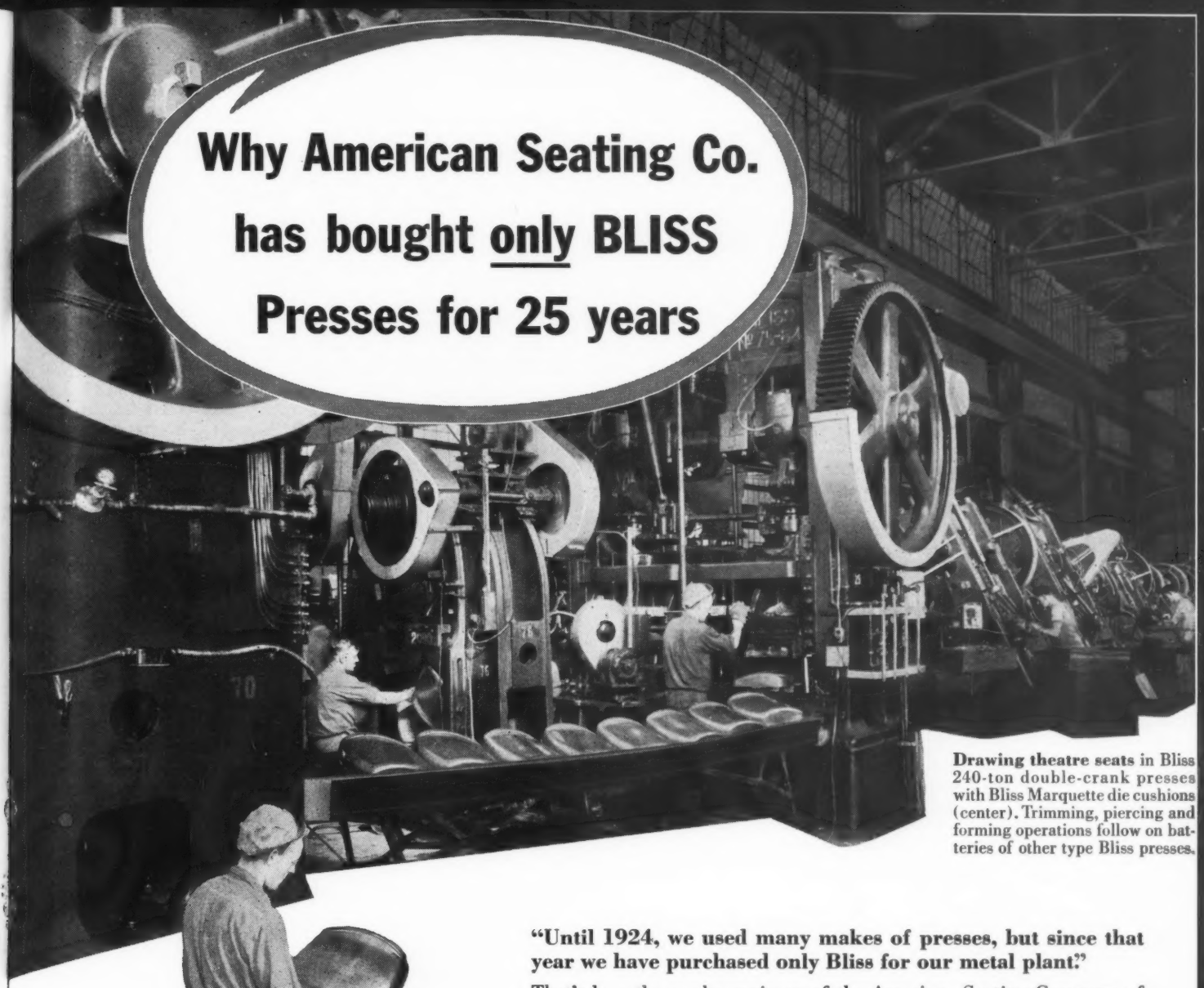
DONALD P. GORDON has been appointed resident salesman, with headquarters at Utica, N. Y., for the Berger Mfg. Division of the Republic Steel Corporation, Canton, Ohio.

TED GRAVENSON has been appointed sales promotion manager of the Burndy Engineering Co., Inc., New York City, manufacturer of electrical connectors.

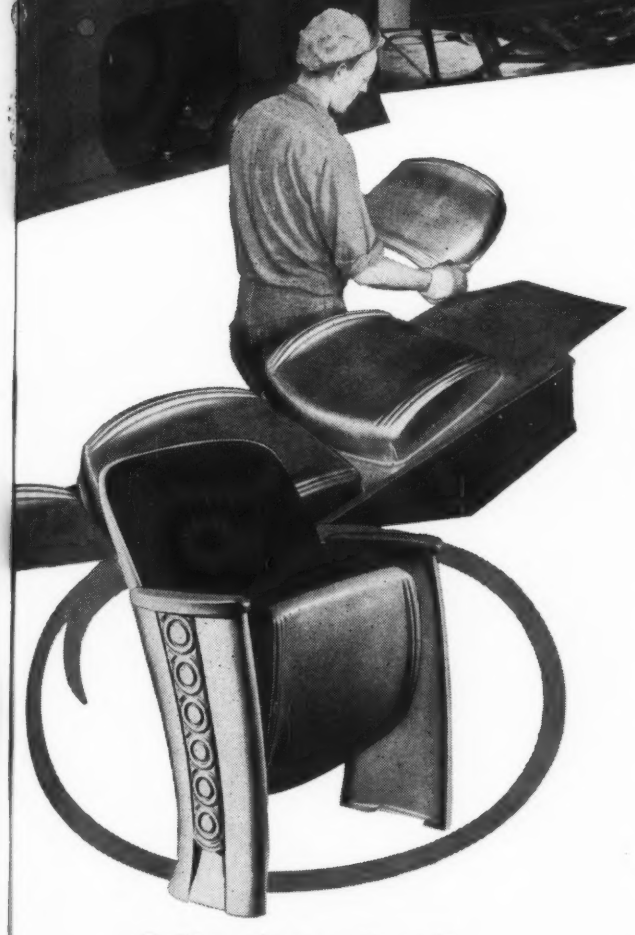
North Carolina and Texas

DENISON ENGINEERING CO., 1160 Dublin Road, Columbus 16, Ohio, has announced the appointment of the HENRY WALKE CO., 1310 S. Tryon

Why American Seating Co. has bought only BLISS Presses for 25 years



Drawing theatre seats in Bliss 240-ton double-crank presses with Bliss Marquette die cushions (center). Trimming, piercing and forming operations follow on batteries of other type Bliss presses.



Bodiform theatre seats consist of a variety of different stampings, all produced on Bliss equipment.

"Until 1924, we used many makes of presses, but since that year we have purchased only Bliss for our metal plant."

That's how the works engineer of the American Seating Company of Grand Rapids, Michigan, world's largest manufacturer of public seating, tells the story. Today this plant is 75% Bliss-equipped—63 Bliss-built presses in all, including inclinables, horn presses, arch presses, end-wheel, and straight-side single- and double-crank presses.

"What do we like most about Bliss? Well, I'd say it was that extra margin of dependability—and that includes more than press performance," adds the works engineer, who is responsible for the purchase and operation of all of American Seating's metal-working equipment.

Here's what he means by "more than press performance":

1. Engineering counsel on equipment for new stampings.

2. Prompt assistance on presses "down" for repair.

3. Instruction of press-room personnel.

A Bliss sales engineer will tell you of many similar case histories and help you get the most out of your pressed-metal production. Send for him today. See our Catalogue in SWEETS—or send for Bulletin 35-B.

E. W. BLISS COMPANY, TOLEDO 7, OHIO

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

WORKS AT: Toledo, Salem, Ohio; Hastings, Mich.; Derby, England; St. Ouen sur Seine, France. SALES OFFICES AT: Detroit, Mich.; New York, Rochester, N. Y.; Cleveland, Toledo, Salem, Ohio; Philadelphia, Pittsburgh, Pa.; Chicago, Ill.; New Haven, Conn.; Windsor, Ont.

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY IN THE WORLD

MARQUETTE · BLISS · CO. · BUILT · TOLEDO · OHIO

BLISS BUILT

St., Charlotte, N. C., as representative in North and South Carolina for the Multipress line of oil-hydraulic presses and accessories.

LOVEJOY TOOL CO., INC., Springfield, Vt., has appointed the A. J. ROD CO., 924 M & M Bldg., Houston, Tex., exclusive representative in southern Texas for the Lovejoy line of milling cutters and other inserted-tooth type tools.

Ohio

ROBERT S. STRAWSBURG has been appointed resident field engineer in Europe, with headquarters in Paris, France, for the Warner & Swasey Co., Cleveland, Ohio. He will work

Robert S. Strawsburg, resident field engineer in Europe for the Warner & Swasey Co.

with the company's thirteen dealers established throughout England and the Continent in the application of Warner & Swasey turret lathes, automatics, and tapping machines. For the last three years, Mr. Strawsburg has been with the company's East Orange, N. J., office.

RESISTANCE WELDING INSTITUTE, an educational organization for the dissemination of information on technical advances in resistance welding, has been established by a number of companies interested in resistance welding. LEE H. JUDGE has been appointed director of the Institute, with headquarters at 519 C.T.S. Bldg., Cleveland, Ohio.

J. H. TREDINNICK was recently named vice-president of the E. W. Bliss Co., Toledo, Ohio. Since 1935, Mr. Tredinnick has been manager of the company's Hastings, Mich., plant,

J. H. Tredinnick, recently appointed vice-president of the E. W. Bliss Co.

which specializes in the manufacture of small and medium-sized punch presses and high-production presses. Prior to joining the Bliss organization, he was factory manager of the V & O Press Co., Hudson, N. Y., for six years.

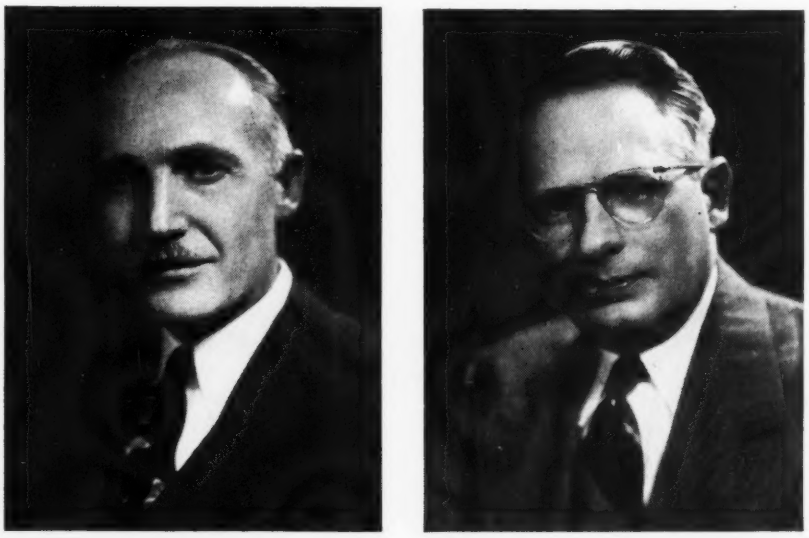
RELIANCE ELECTRIC & ENGINEERING CO., Cleveland, Ohio, announces the following additions to its staff of field sales application engineers: BYRON O. LUTMAN, Detroit, Mich.; ROBERT C. SUTTLE, Cincinnati, Ohio; WILLIAM H. CHAMBERS, Syracuse, N. Y.; ROBERT L. POTTER, Pittsburgh, Pa.; WILLIAM B. MALEY, New York City; EUGENE H. SOWERS, Philadelphia, Pa.; J. ROBERT ZAHN, Cleveland, Ohio; ROBERT MAGNETTI, Chicago, Ill.; and ROBERT B. REED, Birmingham, Ala. It is also announced that CLYDE F. GIEGEL has joined the Pittsburgh office as a field service engineer, and ALBERT M. CHERRY has been transferred from Cleveland to the Rockford sales office.

ALAN CARVER has been appointed manager of the New York City branch office of the Standard Tool Co., Cleveland, Ohio, manufacturer of drills, reamers, and other cutting tools. Other recent appointments and promotions are as follows: PAUL E. LEES, vice-president in charge of sales; JOSEPH W. BREMER, secretary-treasurer; WILLIAM S. O'CONNER, sales manager; ELTON HOYT, III, assistant sales manager; LEWIS D. FYKSE, manager of service engineering; and NORMAN DUENK, chief metallurgist.

THOMPSON GRINDER CO., Springfield, Ohio, announced, at an open house attended by several thousand persons, the introduction of two new machine tools—the Hydrail surface grinder and the Truformatic contour grinder. Also on this occasion, Christian Baldenhofer, president of the company, honored all employes of over twenty years' service.

LINCOLN ELECTRIC CO., Cleveland, Ohio, has announced the election of the following members to its board of directors: G. F. CLIPSHAM, assistant to the president; WILLIAM IRRGANG, director of plant engineering; and L. K. STRINGHAM, director of welding development.

A. J. FITZGERALD, sales manager of the Cleveland Punch & Shear Works Co., Cleveland, Ohio, has been promoted to the position of general manager. Mr. Fitzgerald has been with the company for the last thirty years, having held several executive positions. He will be succeeded as sales manager by A. W. SCHULTZ.



(Left) A. J. Fitzgerald, recently appointed general manager, Cleveland Punch & Shear Works Co. (Right) A. W. Schultz, new sales manager

Remove up to 6 cu. ft. of Cast Iron Per Tool Grind on Modern Planers

Kennametal Mechanically-Held Assembly Provides Outstanding Sturdiness; Permits Fullest Use of KENNAMETAL
Improved Shockproof KENNAMETAL K1 Withstands Heavy Cutting Pressures and Cratering Action of Modern Types of Cast Iron

Strong, Durable, Clamped-on Kennametal Planer Tools . . . Make Heavy-Duty Planing Practicable

Now you can take heavy roughing cuts at high speeds (100-250 ft/min) on any of the newer type planers having a tool lifter. Clamped-on Kennametal Planer Tools make it practicable . . . and *profitable*. They remove metal at a faster rate—keep machine down time to a minimum—reduce tooling cost per piece—minimize grinding time and confusion.

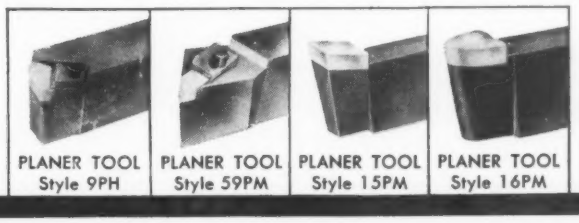
Yes—you need a good, rigid, properly-powered, correctly-adjusted planer. And you *must* have a strong, shock-proof, thermal-strain-free carbide tool that can take a beating and like it. Here's where the uniformly sound structure of mechanically-held Kennametal K1 pays off. Read these typical performance reports:

"Kennametal Planer Tools remove 6.5 cubic feet of semi-steel per tool grind." "5 cubic feet of 180 Brinell cast iron removed per grind." "6 cubic feet of 180 Brinell cast iron removed per grind."

Our field engineers can help you apply this cost-cutting Kennametal tooling to your planing operations. Ask them to do it. And keep in mind—the cemented carbide that has the strength and durability to do tough roughing jobs on planers successfully is the carbide that can cut tooling costs on *all* your milling, boring machine, and lathe work. That's Kennametal.

KENNAMETAL *Inc.*, Latrobe, Pa.®

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION



JOHN S. BARNES CORPORATION, Rockford, Ill., manufacturer of hydraulic structures, controls, and fluid power units, has appointed the CINCINNATI INDUSTRIAL SALES CO., 2832 Stanton Ave., Cincinnati 6, Ohio, sales representative in Ohio, south of and including Dayton, and in Indiana, south of and including Indianapolis.

BERTON M. SHARPE has been appointed sales engineer by the Standard Furnace Division, Surface Combustion Corporation, Toledo, Ohio. He will cover the territory of southern Indiana, southwestern Ohio, and northern Kentucky.

ROBERT F. MYERS has been appointed general sales manager of the Lees-Bradner Co., Cleveland, Ohio, manufacturer of precision machine tools for generating gears and threads. Mr. Myers previously served in the capacity of sales engineer.

SIDNEY MACHINE TOOL CO., Sidney, Ohio, has appointed the WM. K. STAMETS Co., Rockefeller Bldg., Cleveland 13, Ohio, dealer for the sale of the company's line of engine and tool-room lathes.

ERIC G. SKARIN has been appointed service metallurgist for the Ohio Ferro-Alloys Corporation, Canton, Ohio. He formerly served in a similar capacity with the Midvale Co., Philadelphia, Pa.

MOTCH & MERRYWEATHER MACHINERY CO., Cleveland, Ohio, announces the opening of a Used Machinery Division at 1350 E. 222nd St., Euclid, Ohio.

Pennsylvania and Maryland

VACUUM CASTING CORPORATION, 401 E. Erie Ave., Philadelphia 34, Pa., has been organized to promote the development and licensing of a new process for refining and casting metals in vacuum. Officers of the corporation are president, FREDERIC O. HESS, president of Sales Corporation of America; treasurer, RAWSON L. WOOND, president of Arwood Precision Casting Corporation; and secretary, E. WELLFORD MASON. DAVIDLEE VON LUDWIG, the inventor of the process, has been appointed director of research. The company announces that the ARWOOD PRECISION CASTING CORPORATION, Brooklyn, N. Y., has been granted a license to use the new process.

PITTSBURGH SCREW & BOLT CORPORATION, Pittsburgh, Pa., announces the following changes in personnel: WALLACE W. SMITH, formerly general superintendent of the Pittsburgh plant, has been appointed manager of operations of both the Pittsburgh and Graham plants; and RUSSELL T. POLLOCK, assistant superintendent of the Pittsburgh plant, has been promoted to the position of general superintendent of that plant.

F. W. BREMMER, for twenty-five years with the National Supply Co., Pittsburgh, Pa., has been elected vice-president in charge of manufacturing. The position has been vacant since the retirement of CHARLES R. BARTON a year ago. Mr. Bremmer has been works manager of the Spang-Chalfant Division's plant at Ambridge, Pa., since May, 1948.

C. E. HAMMOND has been appointed quality engineer of the Shippensburg, Pa., division of SKF Industries, Inc., Philadelphia, Pa. Mr. Hammond joined the concern in 1947 as a time study engineer. Previous to that he was associated with the Fairchild Engine & Aircraft Corporation of Hagerstown, Md.

DR. ARPAD NADAI, consulting mechanical engineer for the Westinghouse Research Laboratories, Pittsburgh, Pa., and internationally known specialist in the plastic flow of metals, has retired after more than thirty-five years' service in his field.

DAVID A. STUART, sales representative of the Heppenstall Co., Pittsburgh, Pa., recently retired under the company's pension plan, after twenty-four years of service.

JACK W. CRAWFORD has been made manager of the newly created Distributor Sales Division of the Firth Sterling Steel & Carbide Corporation, McKeesport, Pa.

SCULLY-JONES & CO., Chicago, Ill., has appointed the G. C. WOOD CO., 814 Clark Bldg., Pittsburgh, Pa., exclusive representative in the Pittsburgh area.

R. A. LOMAS, service engineer at the Seattle branch of the Black & Decker Mfg. Co., Towson, Md., manufacturer of portable electric tools, has been transferred to the Los Angeles branch. G. S. ELLIS succeeds Mr. Lomas as service engineer at Seattle.

Wisconsin

WADE A. ESKRIDGE has been appointed service manager of the Twin Disc Clutch Co., Racine, Wis., manufacturer of clutches, marine gears, and hydraulic drives. He was formerly assistant district manager of oil-field territory, with headquarters at Tulsa, Okla. Announcement has also been made of the appointment of JACK N. YETTER as district sales engineer in charge of the Tulsa office, and of the promotion of HARRY T. PECK from the position of installation engineer to district sales engineer, with headquarters at Dallas, Tex.

CARL G. MALMBERG, superintendent of the tank and plate shop of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., is also assuming the duties of superintendent of the company's forge shop, succeeding F. A. BREIG, who has retired. Mr. Breig was foreman of the forge shop at the Dickson Mfg. Co., Scranton, Pa., when that company was taken over, in 1901, by Allis-Chalmers, and, except for an interval of a dozen or so years, had been associated with Allis-Chalmers until his retirement.

K. M. NELSON has been appointed industry specialist for Cutler-Hammer, Inc., Milwaukee, Wis. His duties will involve surveying the over-all motor control requirements of the machine-tool and air-conditioning fields.

* * *

Computing Machine Course Offered by M.I.T.

A course designed particularly to meet the needs of users of industrial types of computing machines will be given at the Massachusetts Institute of Technology, Cambridge, Mass., for three weeks, beginning June 20 and extending through July 9. This course in analogue computation will deal especially with the treatment of engineering problems by machines designed for the solution of differential equations. Those who attend the course require a basic knowledge of calculus and differential equations, but experience in the use of computing machines is not essential.

The course will consist of one and one and a half hours of lectures and demonstrations each week day during the period specified, and will be under the direction of Dr. Samuel H. Caldwell, professor of electrical engineering and director of the Institute's Center of Analysis, to whom requests for further information should be made.

* * *

Correction

A note was published in the News of Industry columns of April MACHINERY on page 226 giving the officers of the Whiting Corporation, Harvey, Ill. The officers listed are those of the Quarter Century Club of the corporation. The correct list of officers of the corporation, who have not been changed, is as follows: President, STEVENS H. HAMMOND; vice-president, JOHN MUNRO; and secretary and treasurer, J. C. THOMAS.

PROPERTIES OF HEAT-TREATABLE ALUMINUM ALLOYS USED FOR DRAWING AND SPINNING

Aluminum Alloy and Temper Designation	Ultimate Tensile Strength, Pounds per Square Inch	Yield Strength, Pounds per Square Inch	Elongation, Per Cent in 2 Inches (1/16-Inch Thick Sheet Specimen)	Brinell Hardness, 500-Kilogram Load, 10-Millimeter Ball
Clad 14S–O	25,000	10,000	21	...
Clad 14S–T3	63,000	40,000	20	...
Clad 14S–T4	61,000	37,000	22	...
Clad 14S–T6	68,000	60,000	11	...
24S–O	27,000	11,000	19	47
24S–T3	70,000	50,000	16	120
24S–T4	68,000	48,000	20	120
Clad 24S–O	26,000	11,000	19	...
Clad 24S–T3	64,000	44,000	15	...
Clad 24S–T4	64,000	42,000	19	...
61S–O	18,000	8,000	22	30
61S–T4	35,000	21,000	22	65
61S–T6	45,000	40,000	12	95
75S–O	33,000	15,000	17	60
75S–T6	82,000	72,000	11	150
Clad 75S–O	32,000	14,000	17	...
Clad 75S–T6	76,000	67,000	11	...

MACHINERY'S Data Sheet No. 635, June, 1949

Compiled by the Aluminum Co. of America

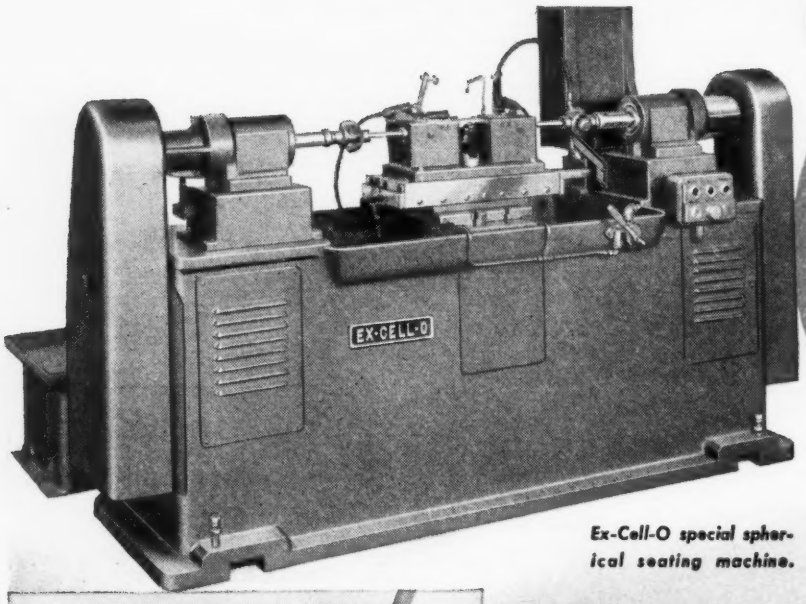
PROPERTIES OF NON-HEAT-TREATABLE ALUMINUM ALLOYS USED FOR DRAWING AND SPINNING

Aluminum Alloy and Temper Designation	Ultimate Tensile Strength, Pounds per Square Inch	Yield Strength, Pounds per Square Inch	Elongation, Per Cent in 2 Inches (1/16-Inch Thick Sheet Specimen)	Brinell Hardness, 500-Kilogram Load, 10-Millimeter Ball
2S–O	13,000	5,000	35	23
2S–H12	15,500	14,000	12	28
2S–H14	17,500	16,000	9	32
2S–H16	20,000	18,000	6	38
2S–H18	24,000	22,000	5	44
3S–O	16,000	6,000	30	28
3S–H12	19,000	17,000	10	35
3S–H14	21,500	19,000	8	40
3S–H16	25,000	22,000	5	47
3S–H18	29,000	26,000	4	55
4S–O	26,000	10,000	20	45
4S–H32	31,000	22,000	10	52
4S–H34	34,000	27,000	9	63
4S–H36	37,000	31,000	5	70
4S–H38	40,000	34,000	5	77
52S–O	27,000	12,000	25	45
52S–H32	34,000	27,000	12	62
52S–H34	37,000	31,000	10	67
52S–H36	39,000	34,000	8	74
52S–H38	41,000	36,000	7	85

MACHINERY'S Data Sheet No. 636, June, 1949

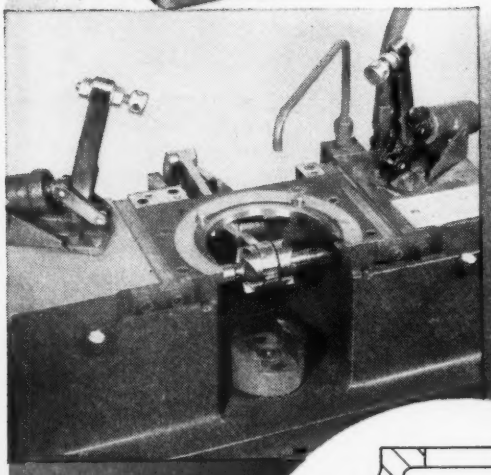
Compiled by the Aluminum Co. of America

GOT A *Machining Problem?*

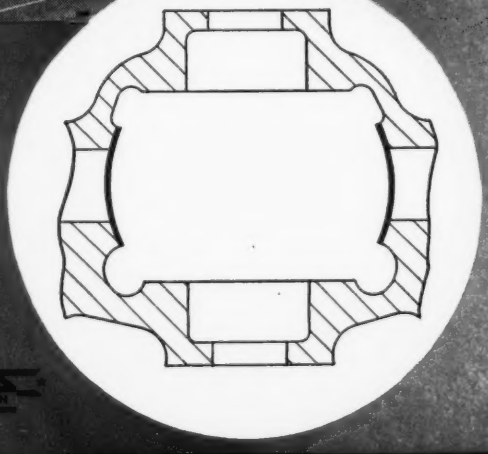


Ex-Cell-O special spherical seating machine.

SEE EX-CELL-O



Left: View of work fixture and cutter on Ex-Cell-O special spherical seating machine.



Right: Heavy lines show operation performed on differential cases with Ex-Cell-O special machine.

XLO
EX-CELL-O for PRECISION

Ex-Cell-O Machine Eliminates Slow Hand Operation on Difficult Job!

Cutting spherical seats inside automotive differential cases is ordinarily a slow hand operation that is out of place in today's production procedure. An operator working on a drill press loads and clamps the part, runs the tool holder into the work, engages the cutter, then cuts the first seat. This cut completed, he withdraws the tool holder and removes the tool. Then he unloads and reloads or indexes the part and repeats the process for the other seat . . . On the Ex-Cell-O special machine shown here the operator merely loads the part, shifts a valve that controls the clamps and presses a start cycle button. At the completion of the cycle he removes the part . . . that's all the operator does. The machine does the rest!

If you have a machining problem, see your nearest Ex-Cell-O representative.

49-27

EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Obituaries

Eben J. Fullam

Eben J. Fullam, chairman of the board of directors of the Fellows Gear Shaper Co., Springfield, Vt., died on April 26 at his winter home in Mount Dora, Fla., aged seventy-eight years.

Mr. Fullam was born in Ludlow, Vt., on March 20, 1871, and engaged in business there following his graduation from Middlebury College. In February, 1898, he went to Springfield, Vt., as a bookkeeper for the Fellows Gear Shaper Co., which concern then employed only about a dozen men. The following year he was elected treasurer of the company, and retained that office until he assumed the vice-presidency in 1939. From 1916 on, he served continuously on the board of directors. In 1945, Mr. Fullam was elected president of the company, which position he held until his retirement in 1948, when he became chairman of the board of directors.

In addition to his connection with the Fellows Gear Shaper Co., Mr. Fullam was, from 1931 to 1935, president of the Bryant Chucking Grinder Co., also of Springfield, and during the last few years he had been a director of the Vermont Foundries. Mr. Fullam took an active part in the machine tool industry, serving at one time as a director of the National Machine Tool Builders' Association. He was also interested in the affairs of the community in which he lived, and had held the position of president of the First National Bank of Springfield.

His death was a source of deep regret to his associates. Those who knew him best described him as quiet, unassuming, completely selfless, and of unshakeable integrity.

C. NEAL BARNEY, vice-president, secretary, and general counsel of the Worthington Pump & Machinery Corporation, New York City, died at his home in Scarsdale, N. Y., on April 24 at the age of seventy-three years. Mr. Barney was a native of Lynn, Mass., and graduated from Tufts College in 1895, also obtaining a law degree at Boston University. He joined the Worthington organization as chief counsel and secretary in 1918, and was elected vice-president and secretary in 1942.

S. B. WARING, secretary-treasurer of the Morse Chain Co., subsidiary of Borg-Warner Corporation, died on May 11 at his home in Ithaca, N. Y. Mr. Waring had been associated with the company for twenty years.

Coming Events

JUNE 4-11—First INTERNATIONAL INVENTORS' EXPOSITION, sponsored by the AMERICAN INVENTORS ASSOCIATION, at the Grand Central Palace, New York City. Secretary, Serge Tray, 2 W. 46th St., New York City.

JUNE 5-8—Thirty-third annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Homestead, Hot Springs, Va. Executive secretary, Newbold C. Goin, Empire Bldg., Pittsburgh 22, Pa.

JUNE 5-10—Summer meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the French Lick Springs Hotel, French Lick, Ind. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

JUNE 27-30—Thirty-sixth annual convention of the AMERICAN ELECTROPLATERS SOCIETY in Milwaukee, Wis., with headquarters at the Schroeder Hotel. For further information, address the Society at 473 York Road, Jenkintown, Pa.

JUNE 27-JULY 1—Annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Hotel Chalfonte-Haddon Hall, Atlantic City, N. J. Headquarters of the Society, 1916 Race St., Philadelphia 3, Pa.

JUNE 27-JULY 1—Forty-ninth semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the University of California in San Francisco, Calif. Secretary, Clarence E. Davies, 29 W. 39th St., New York.

SEPTEMBER 26-28—NATIONAL ELECTRONICS CONFERENCE at the Edgewater Beach Hotel in Chicago, Ill. Sponsored by the Illinois Institute of Technology, Chicago 16, Ill.

OCTOBER 10-14—National meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS in San Francisco, Calif.; headquarters, Fairmont Hotel. Headquarters of the Society, 1916 Race St., Philadelphia 3, Pa.

OCTOBER 17-21—METAL CONGRESS and EXPOSITION to be held in connection with the thirty-first annual meeting of the AMERICAN SOCIETY FOR METALS at the Public Auditorium in Cleveland, Ohio. National secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

OCTOBER 24-28—Thirty-seventh NATIONAL SAFETY CONGRESS and EXPOSITION in Chicago, Ill. R. L. Forney, general secretary, National Safety Council, 201 N. Wacker Drive, Chicago 6.

As part of a program for promoting industrial safety and visual efficiency, workers of the Caterpillar Tractor Co., Peoria, Ill., are given a vision check with the aid of a sight-screening instrument developed by American Optical scientists. The check indicates whether the workers need a complete eye examination and correction

New Books and Publications

TREATISE ON POWDER METALLURGY. By Claus G. Goetzel (Vol. I). 806 pages, 6 by 9 inches; 300 illustrations and 82 tables. Published by Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. Price, $15.

This is the first section of an encyclopedic treatise on powder metallurgy, which will be published in three volumes. The first volume deals with the technology of metal powders and their products; the second will treat of applied and physical powder metallurgy; and the third will contain a classified and annotated bibliography on the subject, covering literature and patents.

Volume I contains twenty chapters covering the terminology, principles, history, theory, technology, production methods, and application of powder metallurgy. The material is so complete that the work is equally useful as an introductory text for a novice, a reference book for the expert, a source of new applications for the development engineer, and a stimulus to new developments and new processes for the inventor. The fundamentals presented in this comprehensive work should equip the reader to understand the most recent developments of the art, such as structural iron and steel components, "infiltrated" powder-metal products, superalloys, new magnetic materials, and combination materials, such as metal-metalloid and metal-ceramic materials.

Starting at the very beginning of the subject, the terminology of the powder metallurgist is explained. Basic principles and the history of the process are treated in following chapters, after which methods of powder production, characteristics, properties and standards of available powders, methods of testing powders, powder conditioning, and the function of addition agents are discussed.

The principles of powder compaction are fully explained in chapters that describe the behavior of powders under pressure and the molding of powders into solid forms. Methods of fabrication and equipment used; die and punch materials and designs; capacities, construction, and operating principles of presses; and principles, apparatus, and techniques of hot-pressing are covered.

The sintering process is given thorough treatment in chapters dealing with the principles and practices of sintering and sintering furnaces and atmospheres. The final chapters relate to the operations that follow sintering, including plastic deformation; deformation by cold-working and by hot-working; resintering; softening, hardening, and finishing treatments such as surface protection and impregnation; joining; shaping; and surface cleaning.

This work, which was prepared over a period of eight years, is undoubtedly the most comprehensive treatment of this important subject published up to the present time. The book is a real contribution to the literature on powder metallurgy.

PERSONNEL SELECTION—TEST AND MEASUREMENT TECHNIQUES. By Robert L. Thorndike. 358 pages, 5 1/2 by 8 3/4 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $4.

Aptitude and achievement tests for selecting personnel came into being at the time of the first World War. They were employed during the period between the wars for educational selection in colleges, for employe selection in industry, and by personnel agencies and psychologists. During World War II such tests were employed in all branches of the Armed Forces. The material presented in the present volume on test and measurement techniques for selecting personnel is the outgrowth of the author's experience in the Army Air Force during the second World War, when he worked on the coordination of research on air-crew selection. For the last three years, this material has been used as the base of a course on the theory of measurement in personnel selection.

The book is made up of two distinct parts, the first eight chapters dealing with the technical problems involved in developing a personnel testing program. These chapters cover job analysis; test selection and invention; estimation of reliability; estimation of test validity; combining tests into a battery; and the analysis and selection of test items. The second part of the book, consisting of the last three chapters, deals with the administrative problems of maintaining a smooth running program with good public acceptance.

MACHINING OF METAL. By Robert E. Smith. 224 pages, 8 by 10 1/2 inches. Published by McKnight & McKnight, 109-111 W. Market St., Bloomington, Ill. Price, $3.50.

Information regarding the machining of metal on modern machines is presented in this book, which contains definite step-by-step instructions for the correct and safe operation of each machine, including tool grinders, drilling machines, lathes, shapers, milling machines, power hacksaws, metal-cutting band saws, and surface grinding machines. The instructions are made clear by the use of many illustrations.

Each section dealing with the various types of machines describes exactly how specific operations are performed. For example, in the drilling section, there is information on how to grind metal-working drills and how to ream a hole by hand or with a machine; and in the lathe section, instructions are given on how to face work mounted between centers, how to turn a taper with a metal-working lathe, and how to cut threads in a lathe.

In addition to the information on the machining operations, sections are included on general safety precautions and on measurements and measuring instruments.

CEMENTED-CARBIDE TOOLS. By D. H. Shute. 82 pages, 5 1/2 by 8 1/4 inches. Published by the Machinery Publishing Co., Ltd., National House, West Street, Brighton 1, England. Price, 3/6d.

The manufacture, design, and application of cemented-carbide tools are discussed in this booklet, which is a revised edition of No. 6 in MACHINERY'S Yellow-Back Series. Inasmuch as these tools played an important part in armament production during the last war, the technique of their application naturally has been improved and extended. For this reason, the text in this edition has been completely rewritten to incorporate the latest information. Attention should be called to the fact that only scant reference is made to negative-rake cutting. This is due to the fact that this operation is really a separate technique and is, therefore, dealt with in a companion volume.

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Machine Tool Show Held in Texas

A machine tool show sponsored by Wessendorff, Nelms & Co. was held April 29 to May 7 in the company's showroom at Houston, Tex. A group of manufacturers cooperated with the concern by sending not only their machines but members of their engineering and sales departments to help take care of the visitors. Those participating were Brown & Sharpe Mfg. Co., Providence, R. I.; Hardinge Brothers, Inc., Elmira, N. Y.; Jones & Lamson Machine Co., Springfield, Vt.; Potter & Johnston Co., Pawtucket, R. I.; and Rockford Machine Tool Co., Rockford, Ill. The show held particular interest for industrial concerns, as the machines were tooled up on production work. In all, 700 guests registered from industrial plants and 267 engineering students from various colleges in the vicinity.